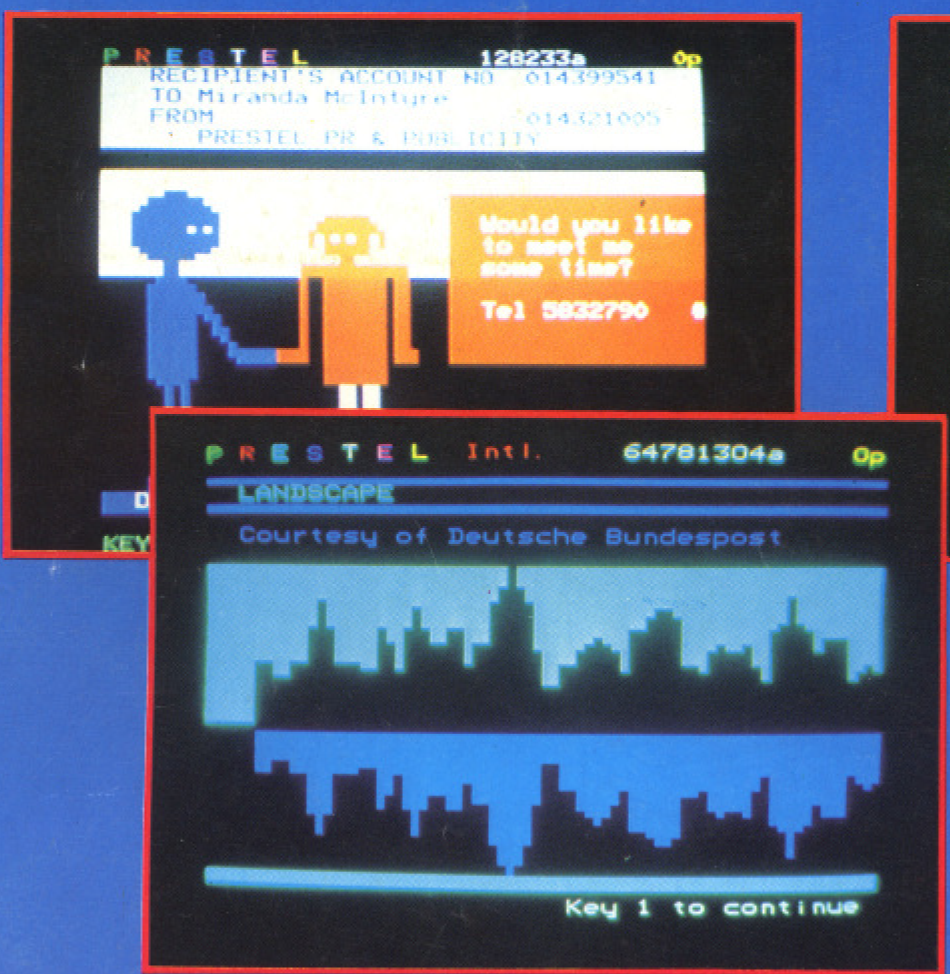
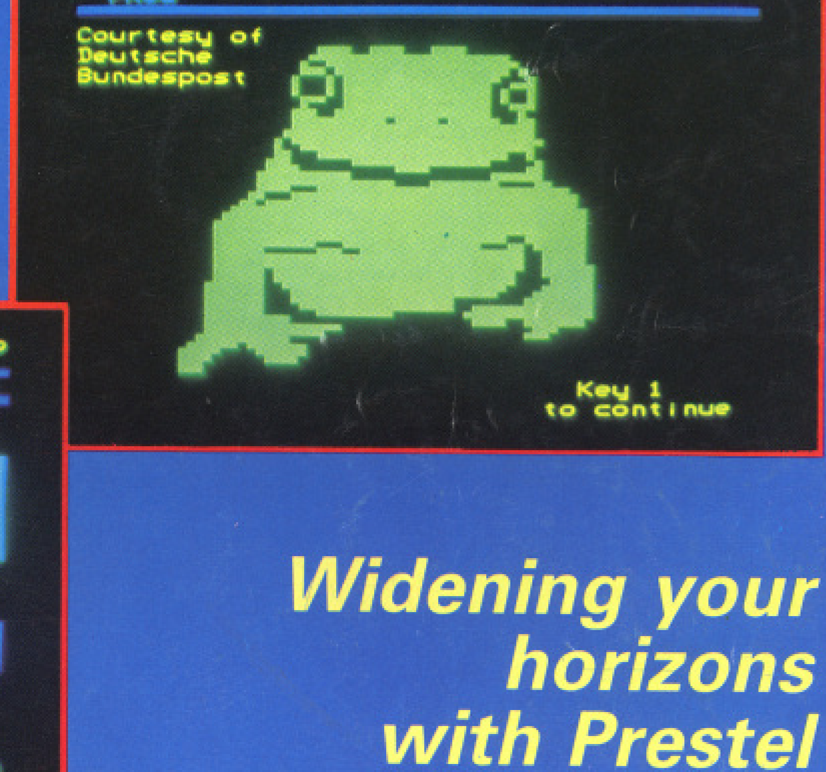
DRAGON USER



The independent Dragon magazine

75p US$3.25 April 1984





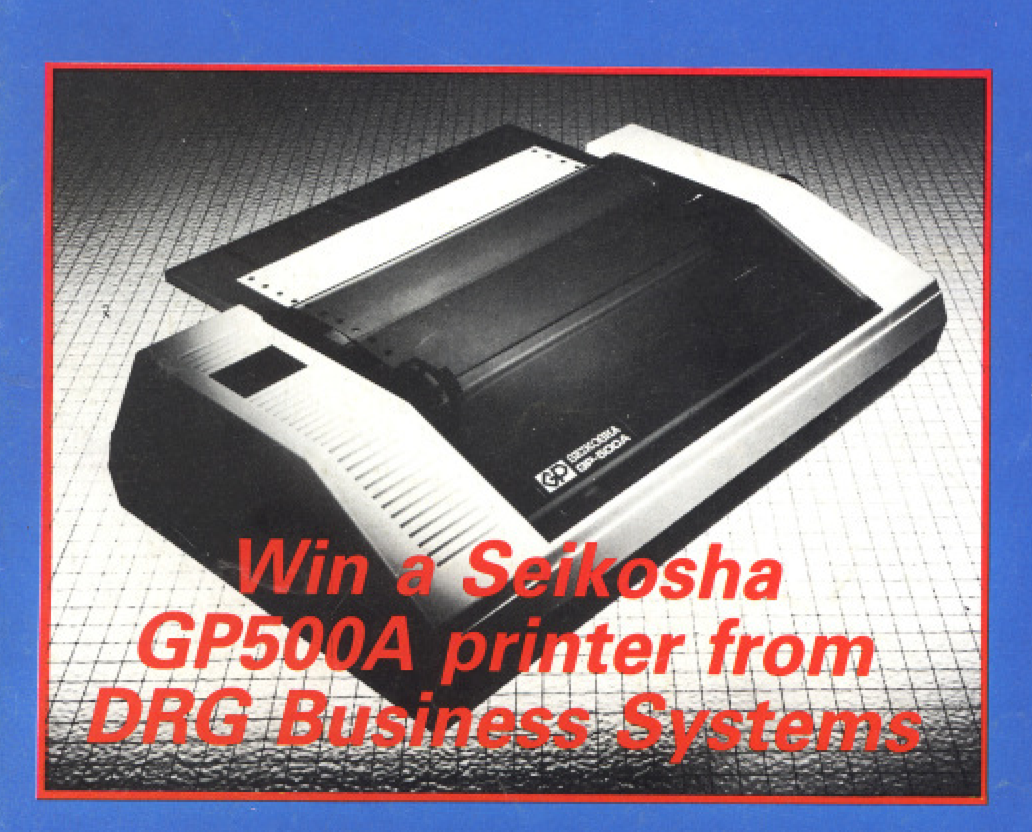
Widening your horizons with Prestel

Building a lightpen

Murmuring in machine code

Latest games reviewed

Putting OS9 through its paces



Win a Seikosha GP500A printer from DRG Business Systems

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extend, depend on the quality of the discoveries that you can make with your Dragon. The Dragon 32 computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Every one of us who uses a Dragon will be able to discover new tricks and quirks almost every day. To help other Dragon users keep up with the speed of the development each of us must assume that we made the discovery first — that means writing it down and passing it on to others.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

"THE ENTRANCE FROM the wings of GEC was not entirely unexpected" was our comment last October when Brian Moore, formerly deputy managing director of a GEC subsidiary, took over the running of Dragon Data. So it was no more of a surprise when the electrics giant moved further into the spotlight earlier this year.

It was announced that sales and marketing of all Dragon Data products had been taken over by another GEC subsidiary, GEC McMichael (this is one way to tell you're dealing with a giant company, when you find it's got subsidiaries everywhere). GEC now has a finger in a lot of computer pies, ranging from such things as specialised chip manufacture to viewdata. It's not clear at this stage exactly what GEC's grand strategy is, but it certainly has enough cash to support any moves it cares to make. And it's also prepared to play a waiting game. Early last summer GEC was involved in talks with another British micro manufacturer, Torch. These talks came to nothing, and only now has the company's interest in the micro market been publicly revived.

However, GEC has missed one chance to invest in Dragon Data. Toy-maker Mettoy, formerly a shareholder in Dragon Data and the founder of Dragon computers, went into receivership at the end of last October — nearly a year after selling Dragon Data off to a consortium of investors. This meant that Mettoy's shares were up for grabs, with the other shareholders having first refusal. At the same time as news of the GEC marketing deal broke, it was announced that existing shareholders had taken over Mettoy's holdings. So one string with the Dragon's past was finally broken, as the GEC strand continued to unravel. The main shareholder in Dragon Data is in fact Prutech, the high technology investment division of Prudential Assurance, itself a shareholder in GEC.

What this manoeuvring means for Dragon users is hard to say. GEC's marketing influence seems more likely to benefit Dragon Data's move into the business market — how much clout the electrics giant can bring to bear on the home computer market remains to be seen. Intriguing, too, is how "interactive" the relationship between the two companies will be. Obviously Dragon Data will be concentrating on developing products GEC is keen to market — so in this way GEC will be playing some role in deciding Dragon Data's direction. Of course there are two sides to being involved with a giant like GEC. Its very size suggests that it will be, on the one hand, lumbering, but on the other, stable. The first seems a little inappropriate for the home computer market but the second does have advantages for users — for example, Micronet's interest in providing a Dragon service has been encouraged by GEC's arrival. And GEC has a reputation for avoiding many of the problems of sheer size by allowing its subsidiaries a great deal of independence.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Oasis replies

I'M AFRAID Maurice Brown has caught us out! The first version of Dragon Chess did have this problem. It was not very sporting to say the least, and did sometimes resign before losing. Not deliberate I promise but a genuine bug.

We cured this a long time ago and I can only think you must have an old version. Please call us or send your full name and address for an immediate replacement. We do, of course, offer this to any other readers with the same problem.

By way of compensation, Oasis Software would like to offer to anybody replacing their Chess the other four games — Backgammon, Othello, Dominoes and Invader Cube — for £9.95 (the full retail price for the Compendium being £19.95).

By the way, our new address is: Oasis Software, Alexandra Parade, Weston-super-Mare, Avon. Phone (0934) 419921.

John Gross,
Oasis Software.

Tapescan code

THE SETSCAN routine in February's *Dragon User* is not to generate the initial Tapescan code as implied in the text, but is a simple Basic program to make loading and copying of the initially saved program easier.

It prepares the machine for the machine code load ie the CLEAR, reads in the Tapescan machine code program, and is then menu driven allowing various options such as motor on/off to position tapes for copying the routines to and automatic copying of both Setscan and Tapescan to further tapes.

I have just spotted a minor error in line 37 of the program listing where the screen message will appear as ". . . THEN CONCLUSION . . ." rather than ". . . THE . . ."

I suggest that Bruce Devlin's excellent short Machine Code Loader routine (page 51 of December's issue of *Dragon User*) be used to initially set up the Tapescan code.

At last I have managed to get the Dream cassette and have used it to assemble Tapescan. Any readers with assemblers with particular quirks, or having problems entering directly from the disassembled listing, should write to *Dragon User* (enclosing a large, stamped and addressed envelope) for a copy of the Dream listing.

I note with interest the comment in Margaret Norman's article in February's issue (page 31) regarding finding out by trial and error how many records may be held in the Addfile program. The techniques detailed in my OM article in the March issue should be of great assistance.

Pam D'Arcy,
High Wycombe,
Bucks.

Which printer?

I HOPE I am in time to prevent others being disappointed.

In the February issue Brian Cadge, in Dragon Answers, suggested the use of the Microtanic Printface to enable a Sinclair printer to be used. I consider that both Brian's statement and Microtanic's advertisement are misleading.

The interface uses the cartridge port, not the printer port. It will only print what is on the screen. It does not respond to the normal print commands. It requires a software input first. And the Dragon version (unlike the BBC shown in the ad) is not cased.

F Thornton,
Taplow,
Maidenhead.

OUR apologies for raising hopes. The Printface comes with screen dump software (cassette plus listing). Users can study how this works and develop their own hi-res programs — and we'll certainly consider publishing any readers' submissions. You can print our your own program listings with the Printface by going through screen by screen. The Dragon version is not cased but the electronics are hidden. Make sure, though, that if you buy a Sinclair printer the power supply is included.

Still on the subject of printers — we got the price of the Tandy CGP-220 wrong in our February issue, it's £499 not £149.

Back to Basics

I HAVE spent a number of nights glaring at the monitor screen in frustration before the following pennies eventually dropped. I pass the information on to save other machine-code freaks from similar pains.

The Dream package (editor/assembler/monitor) is an incredible piece of software, bristling with delights . . . but take a look at the following feature:

```
         ORG     PAGE5
         PUT     PAGE5
PAGE5    EQU     7680
         . . .
         . . .
```

In the above, because the ORG and PUT labels were defined after being used, the assembler, on its first pass, tried to assemble the code in PAGE 0, which is heavily committed to the operating system, and as a result, all hell breaks loose. Labels used in ORG and PUT lines must be defined before the ORG and PUT lines.

When a machine code routine wants to get back to Basic with an RTS instruction, you must be sure that the DP register contains a zero . . . or you will never arrive at Basic.

Alun Evans,
Ynysforgan,
Swansea.

Software Top 10

1	(—)	**The King**	Microdeal
2	(—)	**Eightball**	Microdeal
3	(5)	**Scramble**	Microdeal
4	(—)	**Leggit**	Imagine
5	(—)	**Transylvanian Tower**	Richard Shepherd
6	(—)	**Dragon Chess**	Oasis Software
7	(—)	**Grand Prix**	Salamander
8	(3)	**Cuthbert in the Jungle**	Microdeal
9	(—)	**Devil Assault**	Microdeal
10	(6)	**Ring of Darkness**	Wintersoft

Chart compiled by Boots

Screen scroll

WITH REGARD to T Harvey's letter in Dragon Answers in the February issue, I have written the following program to scroll the screen sideways. I hope this may be of some assistance to Mr Harvey as well as any other reader with this problem.

31990 Holds the start address
31992 Holds the end address

```
7D00  7D00          ORG   32000
7D00  BE            LDX   31990
7D01  96     ADR1   LDA   $B9
7D02  3501   ADR    PULS  CC
7D04  66            ROR   ,X
7D05  3401          PSHS  CC
7D07  30            LEAX  1,X
7D08  4A            DECA
7D09  81            CMPA  #0
7D0A  2EF6          BGT   ADR
7D0C  BC            CMPX  31992
7D0D  2FF2          BLE   ADR1
7D0F  39            RTS
7D10
```

The BASIC program for the above is:

```
10 'SCREEN SCROLL
20 'WRITTEN BY P PHILLIPS
30 FOR X=1 TO 16:READ
   X$:POKEX+31999,X$:NEXT
40 DATA BE, 96, 35, 01, 66, 34,
   01, 30, 4A, 81, 2E, F6, BC,
   2F, F2, 39
```

P Phillips,
Port Talbot,
West Glamorgan.

Tandy recorder

IN VIEW of the continuing saga of the I/O error, some readers may like to know that in a year of trying various cassette recorders with my Dragon, the only one to record and play back data faultlessly has been the Tandy Colour Computer.

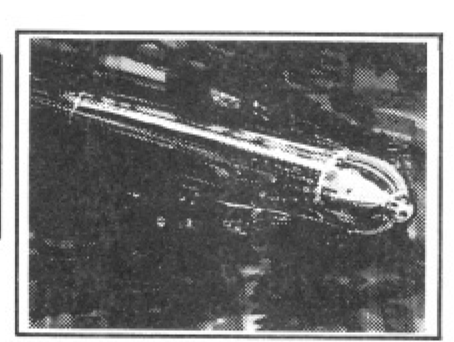
This has operated with all the plugs in all the time (even in long programs). In view of the Dragon's ancestry, this compatibility is not surprising.

A good feature is that the fast forward and rewind keys are not on the remote control circuit, and one does not need to type MOTOR ON to rewind for data files etc. The bad feature is that it is not cheap.

Phillip Birch,
Rushey Mead,
Leicester.





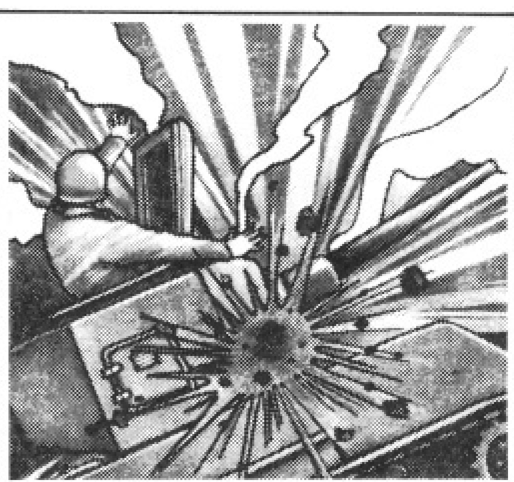




Try and pick off your Enemy from below the waves!

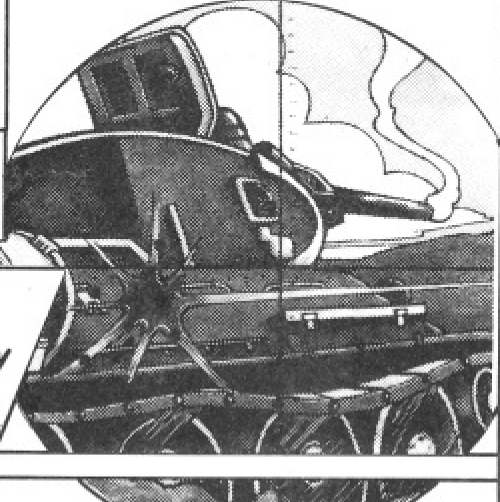


Here comes the first flakes of snow and out of it– their Tanks!



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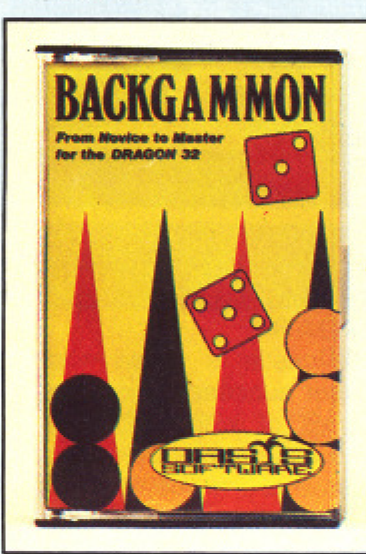
"Dragonchess is without doubt the best value chess on the market today . . ." (Microdeal)

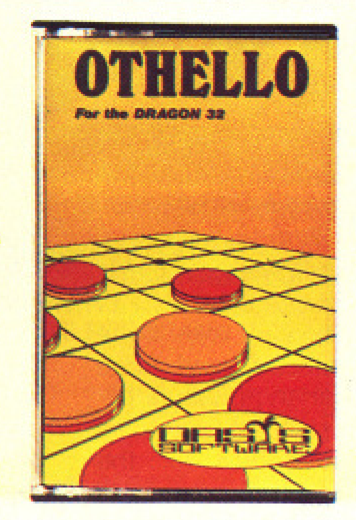
Dragonchess is available from Boots and all good software stores.

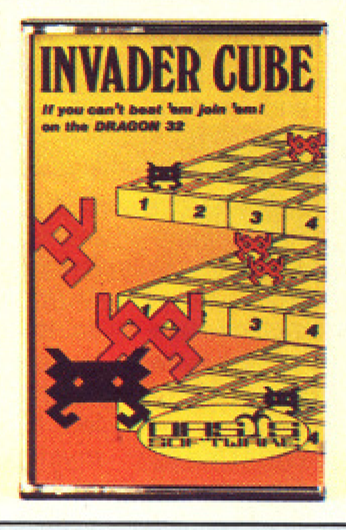
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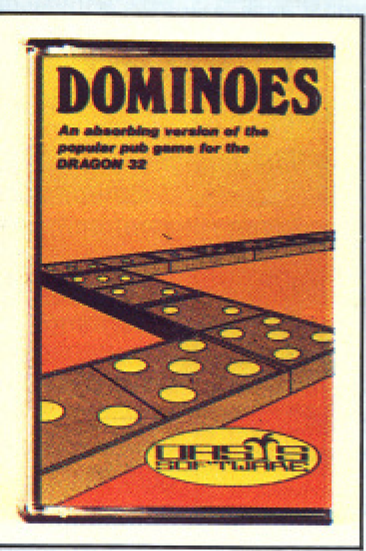
" . . . I thought this was an excellent version of the game. Well worth buying . . ." (Home Computer Weekly)

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GEC selling Dragons

NEW MICROS and peripherals are on the way from Dragon Data following the news that GEC McMichael has taken over its UK sales and marketing.

Few details of the products are available, but plans include joint sourcing on a range of peripherals, with some appearing this summer.

The new micros, up range to the 64 and running OS9, should arrive earlier — with one or possibly two being in the shops by the end of this April.



"He's riding to the rescue"

Micro drives on the way

MICRO DRIVES with a megabyte of memory are on their way from Premier Microsystems.

Single "bare" versions of the 3½ inch Sony drives are already available at just over £200. The dual packaged version, with a megabyte of memory (unformatted), will sell for under £500 — including Premier's disk operating system Delta.

The diskettes themselves cost about £50 for 10 but, as Premier's Mike Bedford points out, they are "virtually indestructible".

All Premier's disk software will be available — covering business, utilities, games and education.

Micronet is set for a spring launch

THE LONG-AWAITED telesoftware service for Dragon users is due to arrive soon from Micronet 800.

BBC and Spectrum users already have access to Micronet, which says that it is planning "to offer software for the Dragon 32/64 this spring".

Two modems will be available — the 1000 at £69.95 and the more software controllable 2000 at £84.95. Additional communications software will bring the price up to nearer the £100 mark. Other modems can be used — write to Micronet for details.

Other costs include a subscription charge of £13 a quarter (£8 for Micronet, £5 for Prestel); a connection charge of 5p a minute in peak hours; and the cost of the telephone call.

In return you get access to a range of free software, micro news, electronic mail facilities, Swapshop and Clubspot — plus the chance to play the interactive game Starnet.

With Micronet you also have access to the rest of Prestel.

All the fun at the fair

THE news from the Leisure Electronics Trader show, held recently at London's Heathrow Penta Hotel, was good for Dragon users.

The show, first of its kind, was a trade only exhibition for the home computer industry. Over 100 exhibitors gathered together to display their best selling and up and coming products and software titles.

Of interest to Dragon software buffs are new titles from Salamander, Shards and Sulis.

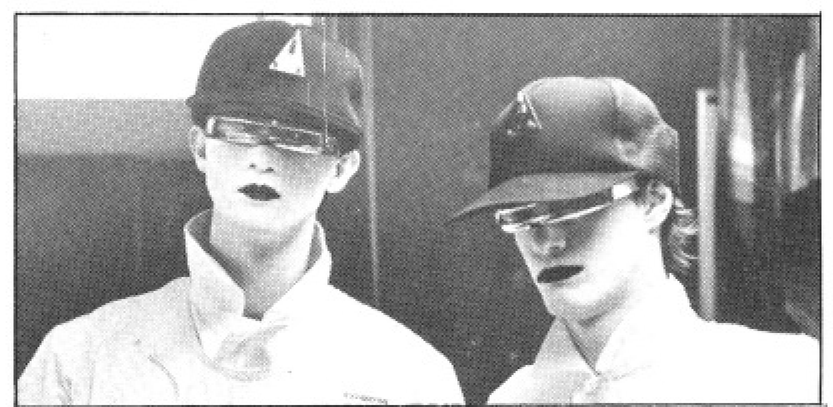
Following on from its January releases, Salamander has scheduled March as the date to launch The White Cliffs of Dover (price £7.95) as a sequel to Wings of War. Having parachuted into France and found a chateau somewhere deep in enemy occupied territory, you now have to make good your escape and reach the safety of "good old Blighty".

And if it's more sequels that you're after, Dan Diamond in Franklin in Wonderland (£9.95) is back. Fresh from the adventures of his original trilogy, he is ready to embark on the first of a whole new second trilogy.

Also being released are Red Meanies, a 3D maze game in the Pacman tradition, and Eagle, a non-violent machine code arcade game originally available for the BBC micro.

From the people at Shards comes a four part educational adventure, a sound utility and a real life simulation game for adults.

Mystery of the Java Sea (£7.95) uses over 100K of memory as you journey from Bristol to London and on to the Caribbean in search of a sunken treasure ship. With three levels of difficulty and three different scenarios, this is billed by Shards as an ideal mystery adventure for the whole family.



Beyond Software's show-stealers at LET

Shaper (£9.95) is a sound utility program, plus manual, which enables you to create a sound from scratch or alter and build on existing sounds by changing one or more of the given variables.

North Sea Oil (£5.75) is an adult financial game written by an offshore engineer. Acting as offshore installation manager, you have to run the oil rig and generate a profit of $100 million.

Sulis Software also has three new releases out now for the Dragon 32, and is planning to release two large programs for the 64.

The programs are all educationally oriented. Besieged is a game to test your vocabulary and spelling. To move a knight over the castle bridge the user has to identify a word from its definition or clue and spell it correctly. For example: definition — bring back to life, jumbled clue — ssscttraaeeiu plus distractors, word — resuscitate.

The castle is saved when the user succeeds in spelling a series of words correctly; and is conquered when three mistakes are made, allowing the infidels to mount the castle steps.

Following on in this vein are Wordpower, a game to help you improve and expand on your use of English, and Just a Mot, which helps you *parlez Français*. Five hundred French words with their English equivalents are given. All three programs cost £9.95 each.

On the negative side of things, Richard Shepherd has no plans at the moment to convert further programs to the Dragon. Transylvanian Tower has sold well according to Richard Shepherd, but not well enough to encourage further conversions.

However, Quicksilva is looking into the possibility of converting some of its successful programs. And Griffin and George, the educational software people, are considering creating programs for the Dragon 64.



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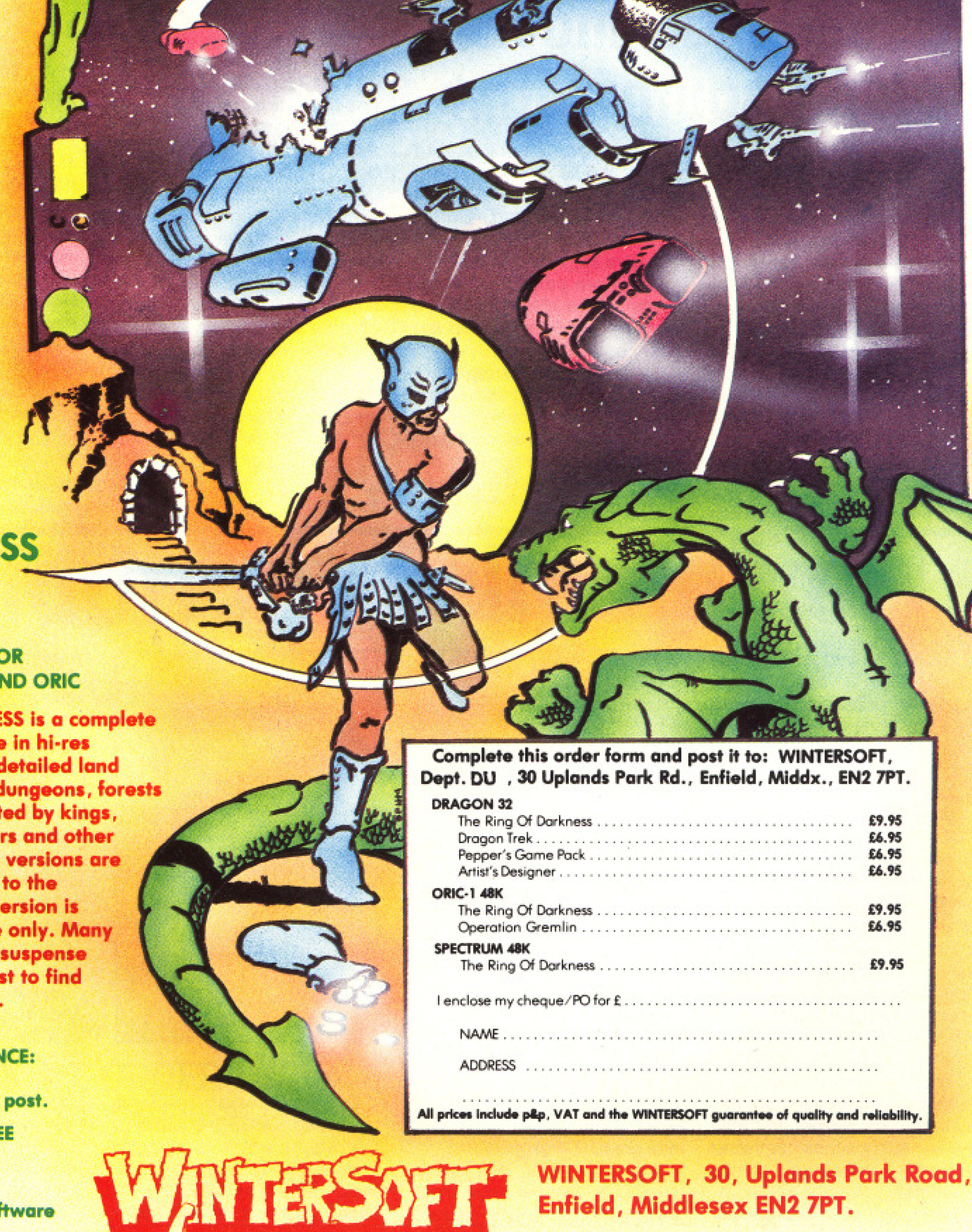
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Its interface board comes as a kit for £40 including manual and plugs into the Dragon's cartridge port.

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Applications include data acquisition and process control, although the board has been designed to be "as versatile as possible". Applications notes and ideas for development are also included.

Electroanalytical Technology can be contacted at 8 Access Road, West Derby, Liverpool L12 4YN.

Users' club moves along south coast

THE DRAGON Users' Club in Wareham has outgrown its former home at Games and Computers and moved along the coast to Bournemouth.

The club is now being run by Computerhouse UK. Alan Monaghan, who is moving with the club, explained that the way "things grew" and the time it takes a new company "to pick up the reigns" had led to some administrative problems.

Computerhouse UK promises to meet any unfulfilled orders as soon as possible. Any queries on outstanding orders should be addressed to the company at 9 Norwich Road, Bournemouth, Dorset — or telephone (0202) 25418 from the beginning of April.

Alan also promises that refunds will be offered to users who are not satisfied with the service.

He added that the cassette-based magazine *Dragonwings* had hit some problems, partly with mixing audio, machine code and Basic programs. But Computerhouse UK was "now on the verge of getting it right".

Going on the air with the Dragon

DRAGON-COMPATIBLE broadcasts are on their way from the Radio 4 Chip Shop programme — and amateur radio fans already have their own network to tune into.

Chip Shop producer Trevor Taylor explained that the Dragon translater was "within days of being ready". However, listeners should wait until the service is announced on the air before sending off any money.

Chip Shop started regular broadcasting in the middle of January. Its initial run ended on the 17th March but summer specials are planned and "normal service" will be resumed on the 15th September.

The Chip Shop programme itself went out on Saturdays at 5 pm. Its Takeaway Service of software was broadcast on four nights a week at 23 minutes past midnight — just after the shipping service.

The Takeaway service is broadcast in Basicode 2. A cassette with programs converting this to machines such as the BBC B and the Commodore 64 is already available — at £3.95 including a handbook.

Once the Dragon version is added users will be able to run both Takeaway broadcasts and any other programs recorded in Basicode 2 on other machines.

The place on the dial to find Chip Shop is 200 kilohertz long wave. It also goes out on VHF and the medium wave — frequencies vary from area to area so check in the *Radio Times*.

Amateur radio fans should turn to 144525 megahertz to join Dragnet on Sunday mornings. The first Dragnet took place on the 1st January from 11.30 to 12.00. The net now starts at 11.00 but organiser R A Davis says that "even an hour is hardly enough".

Apart from participants in the net there is a wide range of listeners. Stations join in from Leicester, Loughborough, Nottingham, Hucknell and Bolsover. And most can be heard over a radius of 50 miles.

Some participants are looking at new ways to allow Dragon to Dragon link-ups on the air and the organiser promises "no doubt we shall soon be enjoying the fruits of their labours".

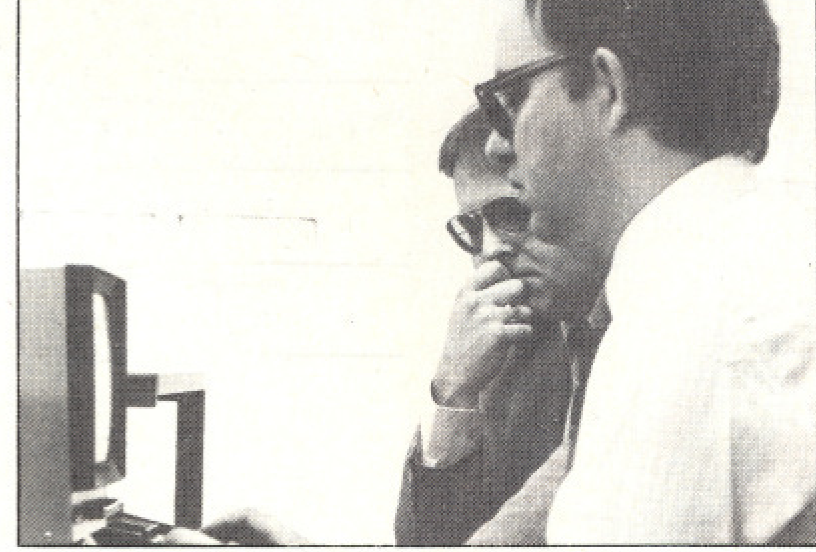
Flex promises portability

FLEX has arrived for the Dragon 64 — in a version which promises portability between rival disk systems as well as rival machines.

London-based software house Compusense has licensed Flex from the US firm TSC. Compusense itself is selling Flex for Dragon Data type disks and has authorised other firms to sell versions for other systems.

Premier Microsystems is selling a version for its disk operating system while Cambridge Microprocessor Systems will be selling a version for the BBC B.

Ted Opyrchal at Compusense points out that this means there will be "portability in applications software across machines and across systems".



Compusense's Stan and Ted Opyrchal – delivering Flex

The range of software available for Flex is one of the things that impresses Ted the most. "You name it, and Flex has got it," he explains.

Flex, at £75, is now set to fight it out with the other main system for 6809-based machines, OS9.

Dragon Data itself is marketing OS9 (reviewed in this issue) which is a multi-user, multi-tasking system. Flex, on the other hand, is aimed more at single users running a single machine. As such, Ted argues, "it's by far the easiest to run".

Help for Basic programmers has also arrived from Compusense in the shape of three new pieces of software — Dynafast, Dynamiser and Dynaxref.

Dynafast is a Basic compiler said to make programs up to 10 times faster. It does this partly by exploiting the internal 16 bit capabilities of the 6809 chip.

Dynamiser combines lines and strips redundant items such as REM statements from programs.

Dynamiser is available on cassette, as is the cross-reference utility Dynaxref. Both are included with Dynafast itself which is available on cartridge or disk (Dragon Data version).

EDIT+

* EDIT+ is a Full Screen Editor and Programmer's Tool Kit. It's an excellent aid for writing programs in BASIC and is easy to use for the novice as well as the experienced programmer. EDIT+ includes all the facilities of HI-RES. Up to 23 lines of your program are displayed on the screen and can be changed by overtyping, inserting, or deleting characters. Functions include: Find String, Change String, Copy Text, Goto Specified Line, Scroll Up Down, Append From Tape and Enter Basic Command. No Dragon is complete without an EDIT+. **£34.50**

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DASM is a versatile assembler, designed especially for ease of use on the DRAGON and allows you to assemble machine code while still retaining the full use of BASIC. Supports all 6809 instructions and modes. Allows any length for labels (the first 5 and the last characters are used). Full support for output to printer. Recommended for the beginner. **£18.95**

DEMON

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* It has all the features of both DASM and DEMON in one package. DEMON is the natural-partner to DASM, complementing each other perfectly. Write, test and use your programmes without the bother of reloading. It is extensively featured in the new book by Ian Sinclair on Dragon Machine Code. It is the ideal combination for the machine code user. **£30.45**

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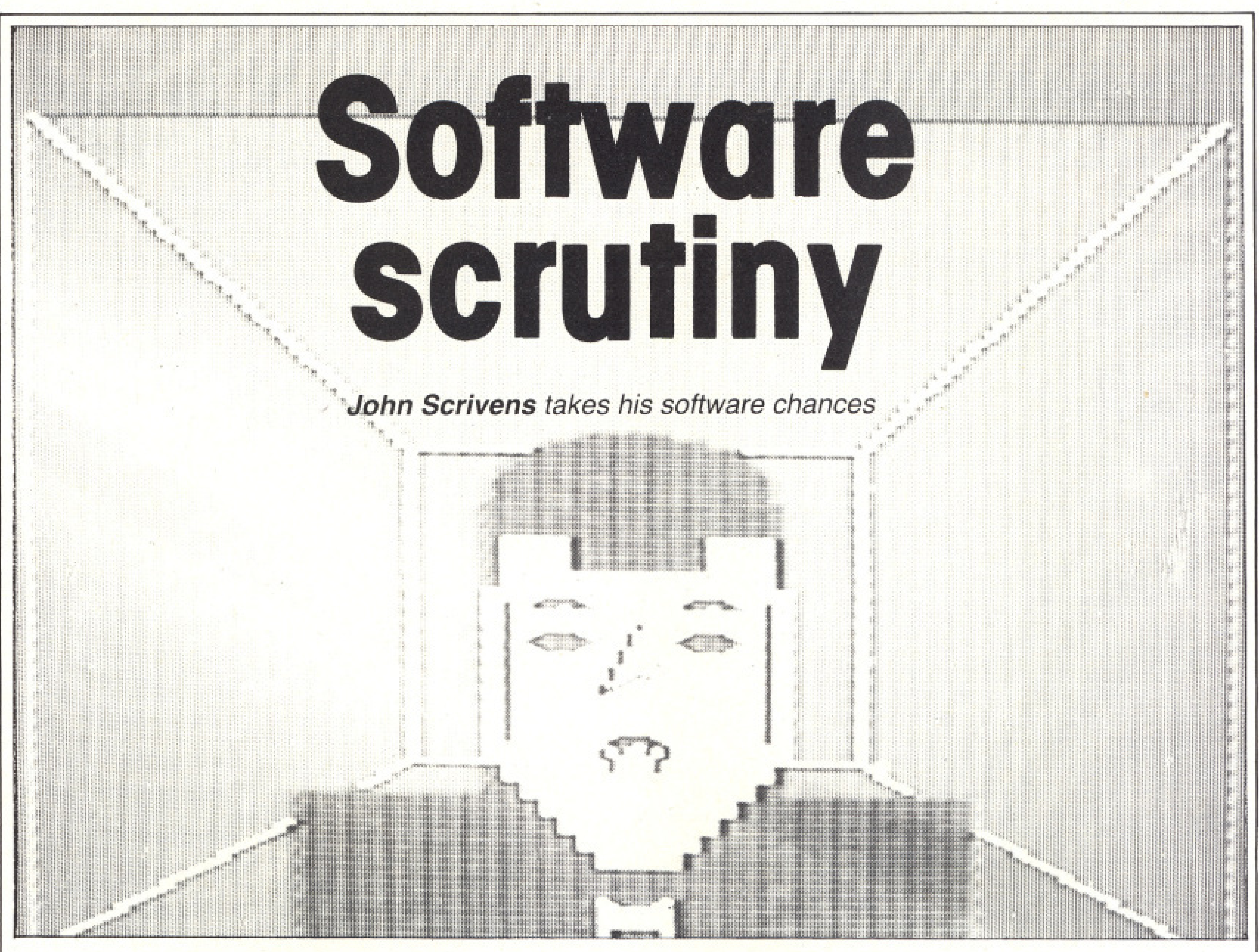
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Software scrutiny

John Scrivens takes his software chances



AS I BEGAN to look through this month's collection I thought I was in for a trip through the New Arcadia. Unfortunately, as I discovered after an evening's exploration, the new games that appear in arcades haven't yet reached the Dragon, and many of the programs are rehashed versions of ones that have been on the market for a long time. I realised I should have kept my mouth shut about "yet another Invaders tape", as that's just what I found hiding at the bottom of the Jiffy bag. (I think it was planted secretly by the editor to test my sanity!)

Last month must have been the first since *Dragon User* started that I didn't have any new Microdeal programs to review. As I was finishing the last paragraph, an enormous parcel of its latest releases arrived from Cornwall, and these are included in this month's review. As usual, there are good ideas along with some more lightweight offerings, and one or two that are a little suspect.

Brain teaser

After the success of Space Shuttle, Microdeal has acquired a Tom Mix program called **Air Traffic Control**. The display is similar to the radar sets in control towers, and shows two runways that cross each other. Small planes queue up to take off, and others fly across the screen. These are not airliners, but Remotely Piloted Vehicles (RPVs), that can be controlled by you. After selecting a difficulty level and plugging in the right-hand joystick, the display shows the control screen, which is surrounded by various instruments. There are seven modes of operation that determine how you can control the planes, and the object is to land safely any that fly across the screen as well as launching those waiting to take off.

The joystick allows you to move a tiny square around the screen and pressing the fire button allows you to lock onto the plane you wish to control. Using the joystick to move the cursor up and down, a little menu display allows you to alter the compass heading, the airspeed and the altitude. Although it took some time to get used to the controls, the 12-page instruction manual explains most of the things that are likely to happen. The only irritating thing about it was the statement that you could watch the display until you were ready, and then press reset to start the game. Don't do this, as you lose the program immediately!

I found it was fairly easy to control planes waiting to take off, but the higher levels of difficulty have you controlling a dozen or so planes all waiting to land. Although I prefer flight simulators, this program is quite good at taxing the brain. I'm not sure how accurate a simulation it is, but the near misses are probably close enough to put you off flying to Spain for your holiday next year.

That industrious American programmer, Ken Kalish (author of Phantom Slayer, Escape and many others) has been at work again. In **Danger Ranger** you control a small figure who has to collect 10 keys from the ends of five floors of a building (Pasha's Chamber). Using the joystick, you have to avoid such problems as Floating Urns, Radioactive Bats and Roving Eyes. You can fire a laser gun to destroy these menaces, or you can jump and duck the missiles they hurl. Once through this screen, you are faced with the Acid Chamber. This consists of rows of stepping stones and the occasional chest of treasure. Unfortunately, large drops of acid fall on your head and rise from the floor, and there are always the demons . . .

Better than Bonka?

Although I don't feel it's his best, seeming like a more hectic version of Bonka, this game is hard to beat at the upper levels, and does show some originality.

Devil Assault is yet another game from Ken Kalish. It doesn't have too promising a start, but soon livens up. A horde of angry vampire bats appears, rather similar to the beginning of the arcade game Phoenix. After these, however, some rather jolly looking robots descend on you. If you can destroy these, you have to deal with some animated dustbins, each of which is called a "sproing" (I always thought that was what came between winter and summer in Australia). These sproings are nastier than the vampire bats and the robots, as they bounce up from the screen's bottom to▶

◀ splat you out of existence. Again, I felt there was something lacking, and it was too much like several other games. In spite of this, it's well written and fast, so if you don't have a similar tape, this one could find a place in your collection.

To boldly go . . .

In the dim and distant past, about eight years ago, a friend of mine who worked for a company whose exact name escapes me (something like IMB, I seem to remember), showed me an intriguing executive game involving the movements of a certain Starship Enterprise. It knocked the spots off video ping-pong, provided your area boss didn't notice you playing it, but I'm sure it's long since vanished to that happy place in the skies where all old computer games finally go. When you pick up **Space Fighter** you could imagine that it's another arcade action special from Microdeal. If you look at the small print on the back of the bulky packaging, you will see that the object of the exercise is to destroy "the aggressive fleet of Krugon Space Cruisers which have overrun the Universe". When you discover further that you are the captain of the starship "Endeavour", and can control warp factor, "photon guided missiles" and "phasers", you begin to realise that this is a thinly disguised version of Startrek come back to haunt us. Only the names have been changed to protect the innocent (or the guilty).

It's more of a medium speed game rather than the "high speed" arcade action that the packaging describes and the Klingons, oops, Krugons, seem rather easy to destroy; although when you realise there are in excess of 200 of them, you will understand that your task is not so easy. Ship movement is accomplished by using the right joystick, although the keyboard is necessary to alter your shields and fire phasers, and this increases the difficulty of the game, as does a docking manoeuvre that has been introduced. Hardly original, but those of you who must boldly go will find this an entertaining version of an old favourite.

I wish I could say the same of the next game. **Space Raiders** should be renamed "Editor's Revenge". If you haven't yet bought Invaders for your Dragon, you could buy this version, as it's as good or bad as any other. All alien life is there, descending about your ears in the time-honoured fashion, and like most Microdeal games, this is available with black, buff or green backgrounds. No more, please, I promise I'll get next month's review in on time . . . 'nuff said!

Imagine is well known for its Spectrum software, and last summer I can recall playing its game Jumping Jack. Six months later in the game of **Leggit**, the small hero returns to try his hand, or maybe his head, on the Dragon. If you haven't seen this game before, you'll soon find that although based on a simple idea, it gets to be quite addictive.

For some reason, Jumping Jack has been renamed Leaping Lenny, although the game in all other respects looks like the Spectrum version. The tiny head-banger appears at the bottom of the screen with eight levels above him and has to progress to the top by leaping through gaps which move along the different levels in both directions. Should he fall through a gap, he will become unconscious for a few seconds and cannot be moved. The same thing happens if you make him jump when there isn't a gap over his head. Because of his habit of hitting everything in sight with his head, a better name would have been Yumping Yossa, especially as Imagine Software comes from Liverpool. If you are nimble-fingered enough, you may reach the top and be faced with another screenful of moving gaps. The problem now is that other creatures are out to spoil Lenny's fun. Increasing in number from one to 20, planes, shotgun-toting hunters and other irritants hurl themselves against your friend. A pleasant change from alien chasing, if you can cope with the high frustration level.

Air Traffic Control **Danger Ranger** **Devil Assault** **Space Fighter** **Space Raiders** **Eight Ball** **Pinball** **Glaxxons** **Dragon Hawk** **Skramble** £8.00 each	Microdeal 41 Truro Rd St Austell Cornwall
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With the increase in popularity of pub games, it's hardly surprising that computer versions should appear regularly. What is surprising is that they should sell quite so well. After all, the skills involved in a game of darts are difficult to simulate on a computer keyboard. Microdeal has just released a version of pool, called **Eight Ball**. Although it states on the packaging that it's in full colour, the clearest screens are seen if you choose a black background. Luckily, the stripes and spots are easy to see, so you don't really need the colours that would be essential in, say, snooker.

Setting the balls in the triangle is achieved from the keyboard, but subsequent control involves the joystick. This can position the cue, select spin and power of the shot and move the cue onto the ball. The object, as in the full-size game, is to sink all your balls and the eight ball before your opponent can. You continue your turn until you fail to sink a ball of your own colour, or sink the eight ball too early. Computer simulations are superb when they allow you to partake in the impossible or even the mildly dangerous, but that surely doesn't include pool. In spite of the clear displays and ease of playing, I feel most people would prefer the real thing. You also need two people to play the game properly — if you could have played against the computer the program would have had more point.

If you go into almost any pub in the land, from the flashiest West End bar to the tiniest country pub, the bleep-bleep and dur-dur-dur-dur of the video machines in the background remind you that we live in an electronic world. Up until the pings and pongs invaded us, the only electrical sounds were those of metallic pinballs clunking their way round the tables. **Pinball** from Microdeal is an attempt to recreate those long-gone days. I suppose my criticisms of Eight Ball could equally well be applied to Pinball. Certainly, the displays are clear, different skill levels are available, sounds are accurate, and the "ball" moves in a very realistic manner. There is little in the way of skill involved in playing the game, however, as the only control is the fire button on the joystick. This controls the speed of the firing bar as well as the flippers. There isn't any of the subtlety of a real pin-table, gently nudging it as you play, and there is no dreaded TILT sign telling you that you've gone too far. It's just rather boring watching the ball bounce around the screen and it is difficult not to score highly.

Daring Dan

Hot on the footsteps of Lost in Space, comes the final part of Salamander's Dan Diamond Trilogy, **Fishy Business**. For those of you who missed parts one and two, this text-only adventure game concerns the exploits of one Dan Diamond. He is a Los Angeles detective in the 1930s, based rather loosely on Dashiell Hammett's Sam Spade and Raymond Chandler's Philip Marlowe. In the first episode, Franklin's Tomb, Dan Diamond gets a message for help, and ends up exploring a mysterious crypt under a house. After spending some time wandering through the basement, Dan gets desperate and shoots off into Space, where he is Lost for the second game. Fishy Business uses the same screen format, a description of the present location, a current inventory ▶


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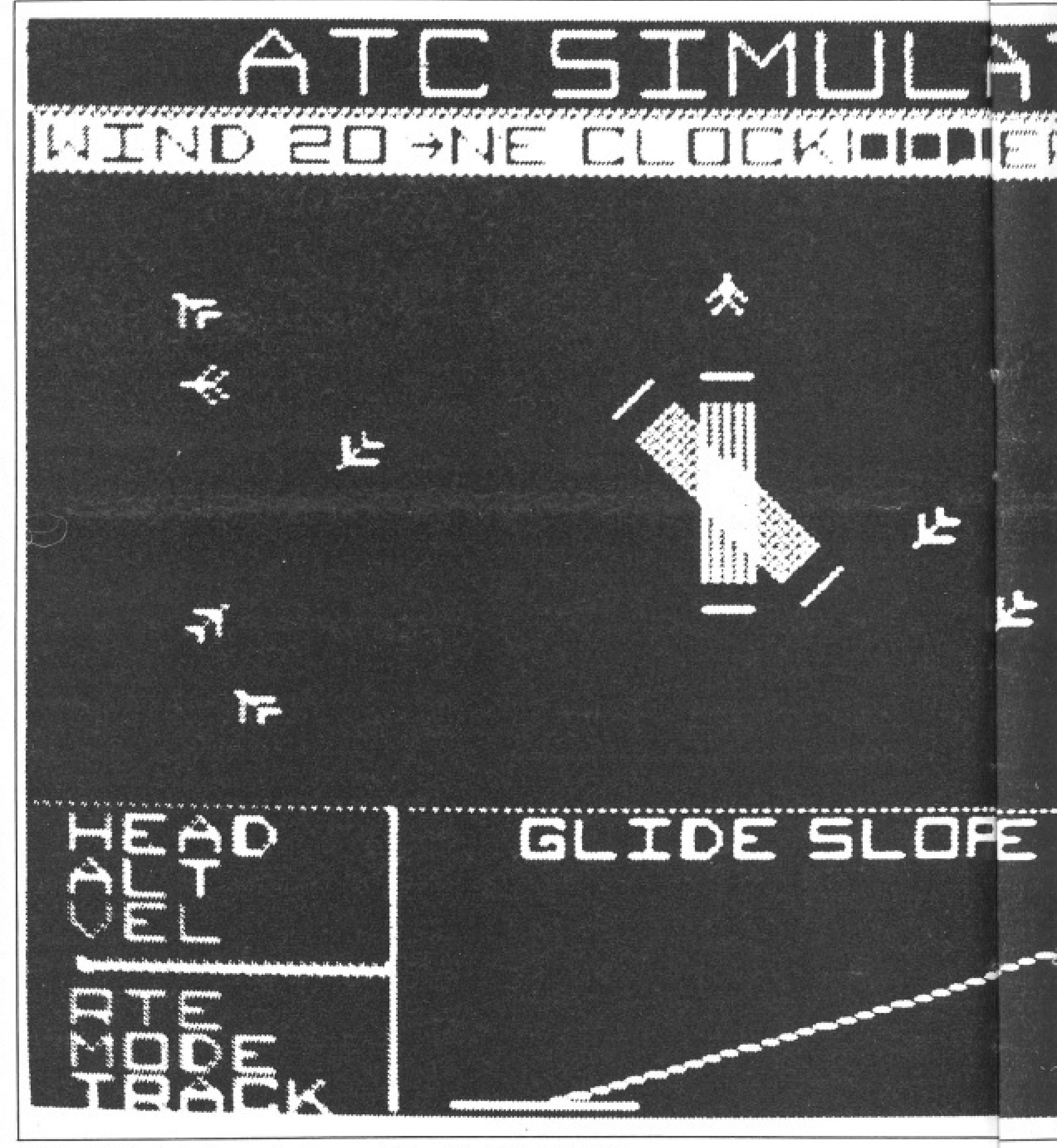
Perhaps I was thinking more laterally when I played this game, but I seemed to get started a little quicker, and the humour seemed better than in Lost in Space. To go into too much detail would spoil the fun (?) of this game, but be prepared for underwater grapplings with Princess Anemone and a location called A Whole Mess of Trouble. If you can cope with red herrings and blue kippers, you will enjoy this game (written, I believe, entirely on location in Brighton Aquarium).

Now back to two more arcade specials from Microdeal. **Glaxxons** is very similar to the start of Devil Assault, in that there's a horde of angry creatures that whirl about at the top of the screen. They break away and swoop down on you, firing missiles as they come. You start with a protective shield that disappears rapidly under the onslaught; the amount remaining is shown on a scale at the base of the screen. The only novelty in this game is the ability to cancel a missile after it's been fired. All in all, it's an average alien zapping game, with nothing in particular to lift it above a hundred and one others.

Dragon Hawk, also from Microdeal, provides a much more interesting storyline, and although you don't have the chance to change the skill level, it's a more complicated game. The display shows a screen full of flies, small birds, larvae and hawks. You control a little man, Watchful Wilberforce, who runs backwards and forwards along the bottom of the screen avoiding the birds and trying to shoot at the hawks. Before conservationists are up in arms, I should point out that one of the hawks has just carried off your friend, Freaky Freddy Flapper, and is about to drop him from a great height. If you can hit the hawk (and miss Freddy), you can rush to the side of the screen to collect a basket which is used to catch your friend before he splats himself onto the ground. As you can imagine, the game gets quite hectic, until you learn which things you can shoot and which you should avoid.

Spacefighters galore

The last tape from Microdeal is a version of Scramble, called with great originality, **Skramble**. The screen scrolls from right to left while you fly your spacefighter over a mountainous landscape and through a cave system, avoiding enemy rockets. It is the strange convention in all versions of this game that in order not to run out of fuel, you have to bomb the enemy's fuel dumps. The display is reasonable, showing the landscape, the particular level of the game that you've reached and the number of planes left as well as your score. I found it harder to reach the upper levels, probably as I was using the joystick option which still entails pressing the space bar to drop bombs. In the end I put my Dragon on the floor, and used my big toe for this purpose. I think I prefer Whirlybird Run from Dragon Data to this version, although both have their good points. If you want a copy of this game, it's probably a good idea to look at both.

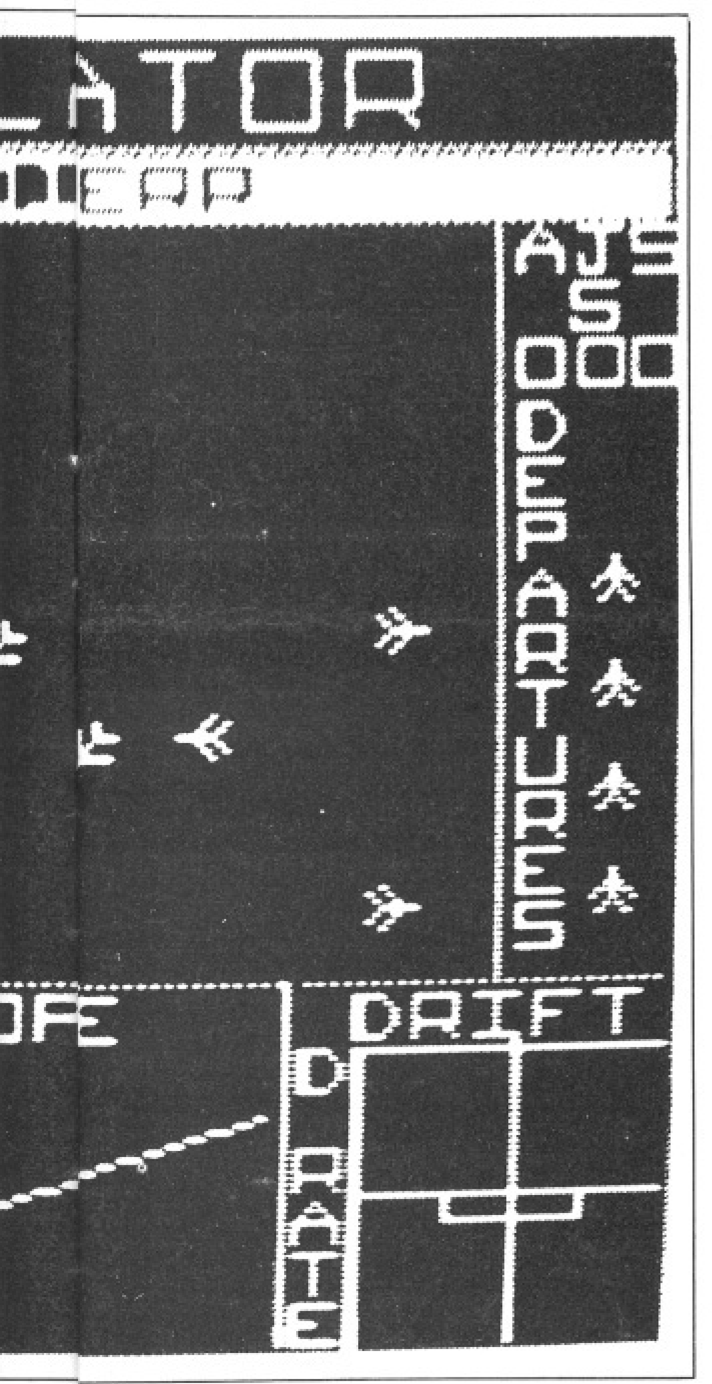


Air Traffic Control puts you in charge of Remotely Piloted Vehicles

When I saw **Photo-Finish** from Peaksoft, I was afraid I was in for a run-of-the-mill horse racing game, complete with low resolution graphics. The start is certainly similar to other race games, with the opportunity to enter the names of up to four punters, and to bet up to £100 on six horses. The horses haven't yet run a race, so they have no form, and the first few races are a matter of luck. Where this game really scores is in the quality of the displays. The horses are shown in great detail, and the rails scroll across the screen. At the finish, you can choose to see a photograph (actually an enlarged corner of the screen), and the race cards gradually build up a good picture of the form to give you some idea how the bookies select the starting prices. If you enjoy the thrill of the race course, but know little more than how to select the Derby winner with a pin, then you should find this program instructive as well as fun to play.

Also from Peaksoft is a highly original game designed to warm the hearts of environmentalists everywhere. **Ossie** is an arcade game that puts you in the role of an osprey with five hungry chicks to feed. The food is strictly self service, and can only be obtained by dive-bombing straight into the river that passes by your tree and flying home with a fish in your beak. All the while this is happening, you have to protect your nest from poachers who continually attempt to climb the tree. You start with five lives, and if you cannot deliver a fish to the nest within 20 seconds, you lose a life. Although you can fly anywhere in the upper screen, to enter the water you must fly very high, then drop like a stone by pressing the fire button. This is a challenging game, and Peaksoft is to be commended for thinking up a new setting.

Last month I enjoyed playing a naval wargame from Beyond Software called Up Periscope. This complex game involved moving a convoy across an area of sea, and you could choose to be the commander of either the submarines or the surface fleet. **Kriegspiel** is played on a similar area, but most of it is land and river. It is divided up into many small hexagons, which gives you six possible directions in which to proceed. The cursor keys move the viewing area about, and even though you can never see the whole field of battle, there is a little map on the instruction sheet. This consists of a piece of folded A4 size paper containing all the information you are likely to need printed in tiny letters.



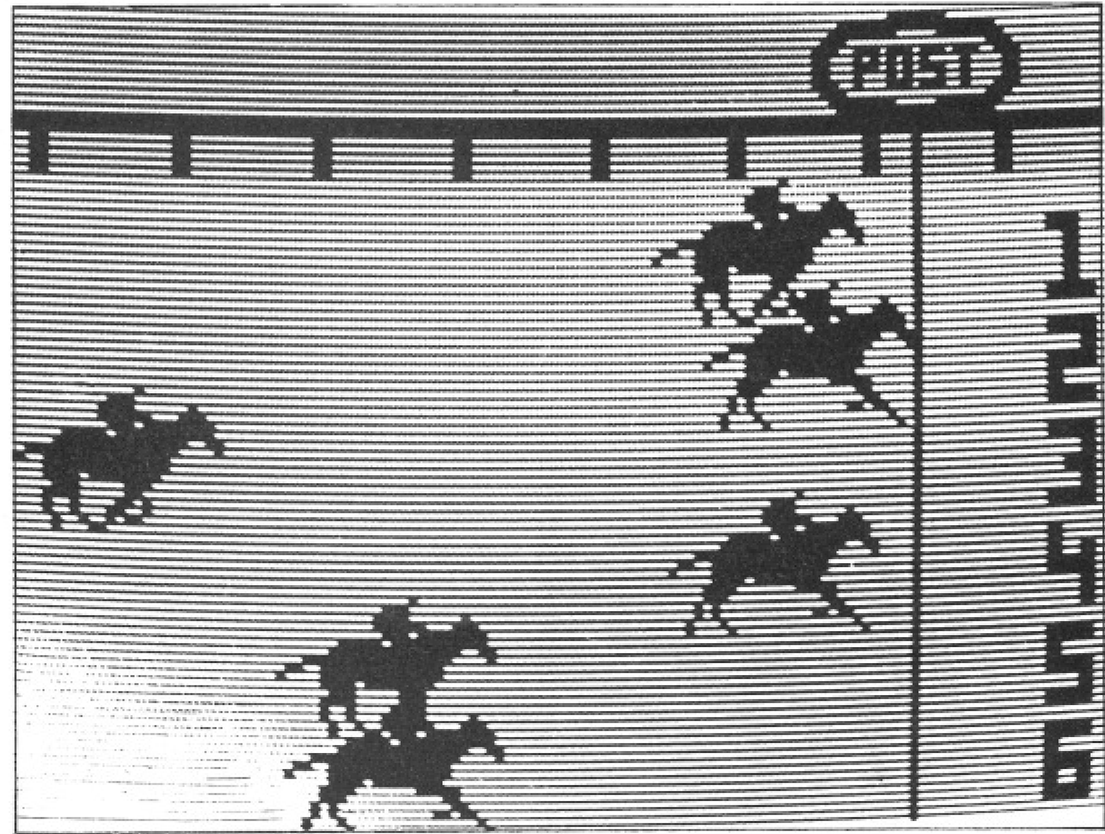
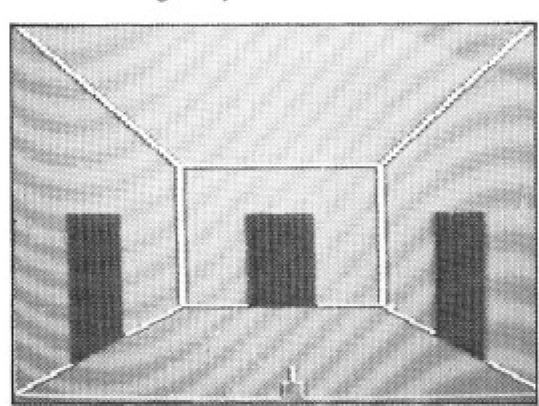
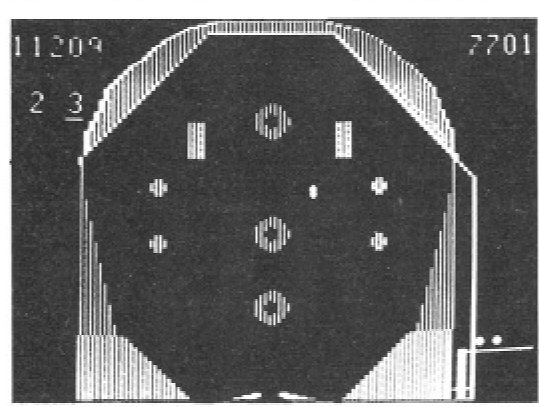


Photo-Finish gives you the excitement of the track



Transylvanian Tower: Count Kreepie's tower



Pinball: recreating long-gone days

Although it's beautifully produced in full colour, it's difficult to read, and a booklet would have been easier. The directions are clear, if a trifle complicated, and you can choose to play against another human or against the computer.

Each army has 15 pieces, comprising four heavy tanks, five light tanks, and six platoons of infantry. It is possible to recruit more men, and you can even lay minefields. It is impossible to give such a complex game the description it deserves; even the time of year plays a part with rain and snow taking their toll. The display is symbolic rather than detailed, but is perfectly adequate for this type of strategy game. Considering the price is only £6.95, this game is well written and makes good use of the screen and displays. Perhaps they'll bring out a more peaceful game next time, then they'll satisfy everybody.

When the Dragon first appeared, it had software that was written specifically for it, and apart from a few exceptions, not many programs could be bought in versions for, say, the Spectrum, the BBC and the Dragon. Recently this has changed, and with the growth of software houses, it's probably economic to employ someone simply to convert your best seller to run on a different computer, or even to struggle with the job yourself. Because people prefer programming on one particular machine, and are able to use its good points and disguise its little foibles, this is not always successful. One software house that has managed to make a satisfactory conversion is Richard Shepherd, which has been writing top selling maze adventures for the Spectrum for some time.

Transylvanian Tower is based on the traditional adventure theme of exploration and treasure collection. It is set entirely in Count Kreepie's tower, a miserable place inhabited by bats. There are five levels, all represented by three-dimensional mazes. At the start you are shown a plan of the maze, and you can come back to this at any time by simply pressing a key. This dungeon level is useful training in maze running, as there's nothing nasty to jump on you here. When you finally reach the exit to this level, you are transported to level two, and here is where your problems begin. There are at least 20 bats to be killed before you can reach the next floor. If you reach the transportation point without finding a weapon, you are moved somewhere at random. If you've just discarded your floor plan, this can be very frustrating!

Eventually you confront Count Kreepie, but as every late night TV viewer knows, all you need is a clove of garlic and a silver cross, and even Christopher Lee cowers in the corner. Although this doesn't require enormous dexterity or brain power to solve, the game is fun for all ages, and shouldn't prove too frightening, even with a full moon in the sky.

Shards Software has been producing interesting programs for some time, and although its early tapes didn't seem to have anything too special, the material produced shows plenty of imagination. Last month it was Pettigrew's Diary, and this month it's **Puzzler**. This game is a computer simulation of one of those plastic games where you move the pieces around a little square frame. In Puzzler, you can choose from three games, with either 12 or 24 pieces, changing colours, and different levels of difficulty. This gives you less time to decide on which of the muddled pieces must be swapped. If you're slow, the computer swaps for you, and the picture becomes even more confused.

You can also choose the picture to be rearranged. There are four choices, a basic flag, a union jack, a lion and a fish tank. this program is excellent in improving memory skills for shapes, and provides a challenging and novel game.

There isn't too much that's completely new this month, but there seems to be quite an assortment to suit all tastes. The programming standard is improving all the time — all that's needed are some fresh ideas. ■

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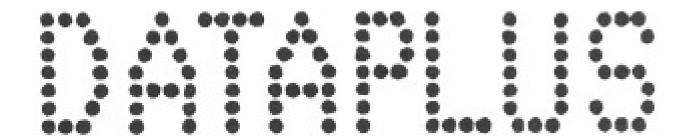
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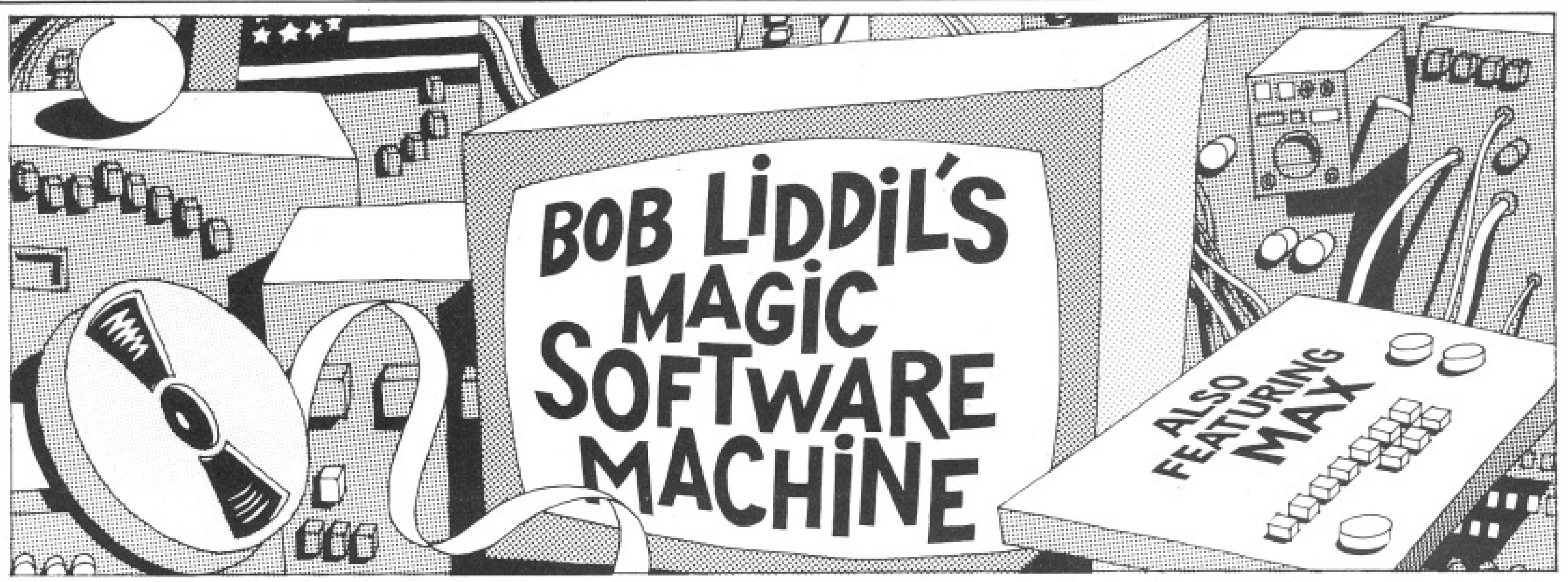
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DU2



EVEN A HARD working software reviewer has to get away to the club for a pint occasionally. I am no exception. As I waited my turn at the dartboard, I overheard this fellow talking to an audience of six interested patrons about his life in the Software Secret Service. Let's listen in shall we?

"In disguise," his story begins, "I become the Software Secret Agent, off on another deadly mission into the hinterlands of softwaredom. My top secret equipment includes some of the old standards, a combination belt buckle telephone/modem and laser blaster in case of aliens, a ballpoint pen watch/microcassette recorder and standard top secret all purpose milk of human kindness gumdrop popper.

Top secret

"This mission was commissioned by none other than the CIA, better known as the Citizens against Interaction in Arcadia committee on plots to reinstate adventure as the number one genre in microcomputer gamedom. The nature of the assignment was so secret that the guy who briefed me wasn't allowed to listen.

"It was simple, all I had to do was investigate rumours that Scott Adams of Adventure International USA, who'd launched a fully computerised submarine, had been kidnapped by Blowhard, the notorious international criminal, oil baron, shipping tycoon and litterbug.

"It was true. Investigation revealed Adventure International's new Sea Dragon, the latest twitch by arcade geniuses Wayne Westmoreland and Terry Gilman has been converted very conscientiously to the TRS 80 colour computer. I must confess that I am among those who embraced this game enthusiastically. It is all you could ask for in state of the art software.

"Sea Dragon succeeds where others have failed as far as combining elements of different popular arcade games into a coherent new activity. By going underwater with their scenario, the dynamic duo of diverse compuanimation freed this offering of all but the most oblique similarities to Defender, Vanguard, and other coin-op twitches.

"Here's how Sea Dragon works. The submarine is launched from shallow water into a sea of floating mines which (most inconveniently) float up to render her to smithereens. Ah, but she is not without defences. The forward tubes spit out an endless stream of deadly torpedoes which are quite capable of destroying these mines. Chained or unchained they are worth points to the player.

"As the cleverly executed seafloor scrolls under her keel, Sea Dragon makes the briney deep safer for mankind. If this were all there were to the game, the terrific twosome would have scored a fair hit with me. But, not content to simply be good, they added other elements.

"First of all, air is not unlimited so frequent surfacing is required. Also, the aforementioned scrolling seabed which makes up the one-way course Sea Dragon must follow is fraught with caves containing killer stalactites which fall, and can do in undersea travellers. And what submarine game would be worth its salt without battleships to blow up? Then there are EATs (Enemy Attack Stations) which fire at random as you pass. Not an altogether safe way to travel, by Sea Dragon, if you ask me. Then there is a reactor (possibly owned by Blowhard, remember him?) which spews radioactive chunks and is protected by a large neutronium shield fabricated by a work force recruited from pro-nuclear plaque carriers at airports in 70 cities.

"Sea Dragon's ability to blow things up extends to both the horizontal and vertical plane and allows a lot of room for growth in skill level. Your arcade munchkins will have to be dragged away from the computer that contains this program. It is a winner, a challenge, an amusement, an achievement and a fair buy for the money — all rolled up into one neatly illustrated package on to which the Adventure International nameless artist has lovingly airbrushed a fine poster quality submarine scene fit for hanging on a computer room wall.

"All this was useful information as I set out to rescue Scott from the clutches of the Guest Evil Villain of the Month, namely Blowhard. I took with me my patented Electromagnetic, Microprocessor equipped, Infra-red Adventure Grandmaster Detector, and a cleverly designed Bad Guy Buster guaranteed to foil any evil plot.

"When I arrived at Blowhard's mansion, I noticed that the lights were dimming. Was I too late? I raced through the corridors to Blowhard's laboratory. The fiend! He was torturing The Phooba of Puzzles by making him read back issues of *Popular Mainframe Monthly*.

"I aimed my Bad Guy Buster squarely at the skulking torturer and fired. But the rays bounced off and melted down my gun. Then he ordered me to drop the BGB or he'd turn up the power and torture poor Scott to death. I hesitated. He reached for a copy of *The Psychology of Word Processing as it relates to preparing reports for Congress*. I knew I was beaten. I capitulated. I dropped the BGB and surrendered. 'Ah ha! I've beaten you!' Blowhard cried triumphantly.

"But as he opened his mouth and let out a squeal of pure joy, I let him have both barrels of my Milk of Human Kindness Gumdrop popper.

"'Oh no!' he yelped. 'Oh, yes, Blowhard!' says I. 'From now on you will have to be kind to everyone you meet, no nasty letters, no dastardly deeds, no littering. The Milk of Human Kindness Gumdrops have no antidote.'

"He left the lab a confirmed do-gooder, and the last I saw of him, he was heading for the coast in his Jaguar, ready to perform massive good deeds in the Orient. Another threat to humanity foiled.

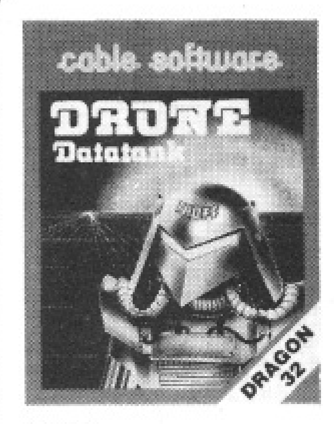
Clever capers

"I turned Scott over to the crew of the Sea Dragon for the long voyage back to Orlando. 'Who was that caped crusader?' I heard him mutter, obviously still dazed from re-reading the instructions to *Fifty Arcade Games for your Dragon*. I chuckled to myself. A good day's work well done, thought I. And wait until the CIA gets my bill."

When the agent had finished the story I left and went home to verify his findings about Sea Dragon. I could find no one who could confirm that it would run on the Dragon at press-time but I believe we'll see this and many other fine American colour computer programs translated and released in the UK.

Max asked me if I wanted to go for a ride on that submarine. I told him to keep away from that Download switch or I'd have him doing bubble sorts on a Sinclair machine. He has agreed . . . so far.■

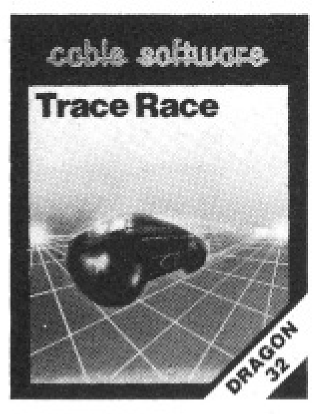
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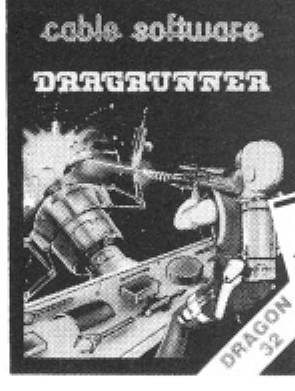
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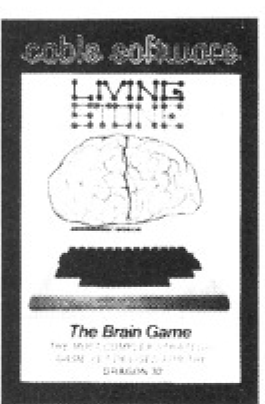
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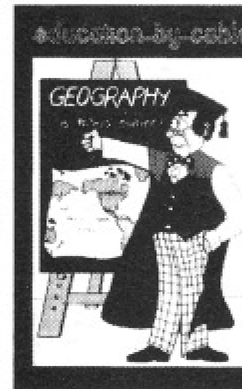
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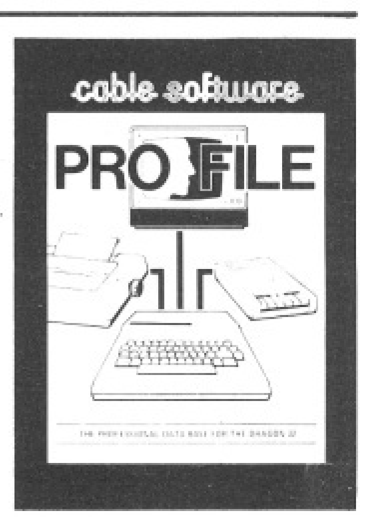


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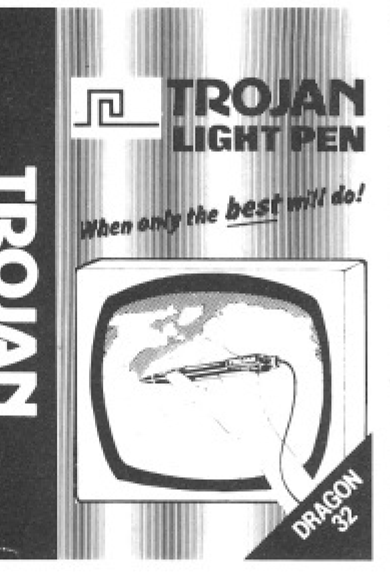


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Plugging into Prestel

Prestel explored by ***Keith and Stephen Brain***

PRESTEL IS A computer database run by British Telecom which can be accessed via the standard telephone network. Although it has now been in operation for a number of years, and currently contains over a quarter of a million pages of information, it appears that it has not taken off as well as was originally anticipated.

The Prestel database is made up of pages, rather like Ceefax and Oracle, which are provided by many different individual organisations. However, a major point of difference from ordinary Teletext is that Prestel is interactive. This means that not only can you view the pages, but you can also actually communicate directly with other users of the system.

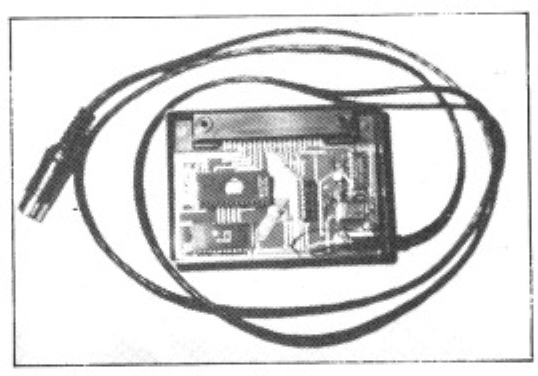
Microcomputer Resources has now developed an interface cartridge for the Dragon (price £49.95) containing an intelligent Prestel terminal which allows Dragon owners to join the growing number of micro enthusiasts who access this network. However, to use Prestel you need more than just an interface to your computer. First of all you need a modem which converts the computer signals to ones which can be transmitted via the normal telephone system, and secondly you need to pay British Telecom for the privilege of using the network. The cost of the cheapest suitable modem is around £50, whilst current Prestel charges are £5 per quarter for domestic subscribers and £15 per quarter for business subscribers, with a further charge of 5p a minute up to 6pm on weekdays and Saturday mornings.

Useful services

Once you have paid these charges, you can call up many Prestel frames without further cost, although you still have to pay for certain pages. Within the Prestel database are some specific areas particularly aimed at microcomputer users. The most well known of these are Micronet 800 and Viewfax 258 which provide information and a commercial telesoftware service for a limited number of machines. Micronet is the main provider in this field and its service is only available to subscribers who pay a joining fee and an extra £8 per quarter. At present it is not offering any telesoftware for the Dragon, although it looks now as if it plans to expand into this area.

The Micro Resources' Prestel unit is built into a standard small cartridge which simply slots into the normal Dragon cartridge port, and a one-metre flying lead then extends to a five-pin DIN plug which must be connected via a modem to your telephone. A peek inside the box reveals a 2764 EPROM containing the terminal software, a 6850P Asynchronous Communication Interface Adaptor, and the crystal and other minor components.

When you power up with the cartridge in place you are greeted with a start screen which queries the screen format to be set up. This is because, although all the menus and prompts appear on the standard text screen, a 40-column high-resolution text driver is used for actual communication with Prestel. Graphics PMODE 4 is used and you have a choice of normal or inverse video in black/white (buff) or black/green combinations.



The Prestel interface for Dragon users

As you may know Prestel frames are normally coloured, but it is not possible to provide this facility on the standard Dragon because of the limitations on colours in the hi-resolution display. (Although colour information is ignored for display purposes, frames will still contain colour display information and will appear in colour on a system equipped with a special viewdata colour card which may be available later.) Once this choice has been made you pass on to the MAIN MENU which displays the available options:

KEY	FUNCTION
1	LOG ON OR OFF
2	TERMINAL
3	SAVE FRAME
4	LOAD FRAME
5	PRINT FRAME
6	DOWNLOADER
7	MAILBOX
8	OPERATING SYSTEM

Pressing "8" from the MAIN MENU always returns you to Dragon Basic, from where you can recall the terminal software with EXEC.

To connect to Prestel you select option 1 (LOG ON OR OFF) and then option 1 of the submenu (LOG ON). Next you must dial one of the Prestel telephone numbers and wait for a continuous high-pitched tone (the carrier). Once this is heard the modem must be connected on line and the screen prompts followed to display the log-on frame, which asks for your user identity and password. Provided that these are entered correctly you are now free to explore the contents of Prestel. All communication is carried out using only the numbers 0 to 9 and the characters * (asterisk) and # (hash), and most Prestel frames offer a number of choices from a menu. Once you know your way around the database you can jump straight to any page by keying, for example, *800# for page 800. (To make life easier for the Dragon user, : (colon) can be used in place of * and ENTER in place of #.)

It is simple to save a complete Prestel frame on to a cassette tape with option 3, and to reload this frame into the terminal again with option 4. Prompts and error messages are provided to guide you through this procedure.

Printing

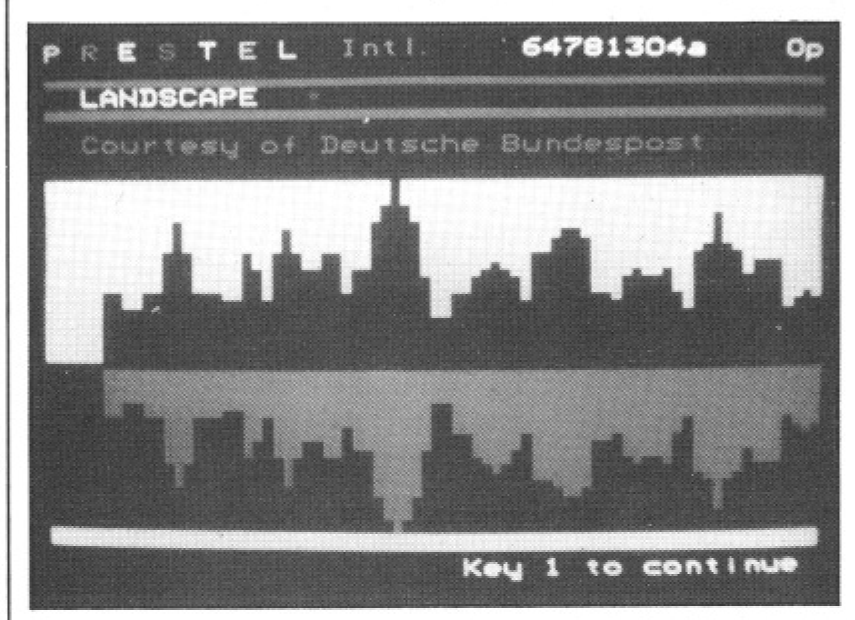
Provision for production of hard copy of Prestel frames is also included on the PRINTER OPTIONS MENU. The text content can be printed out on any standard printer, and if you have an Epson MX or FX series printer, graphics can also be easily dumped.

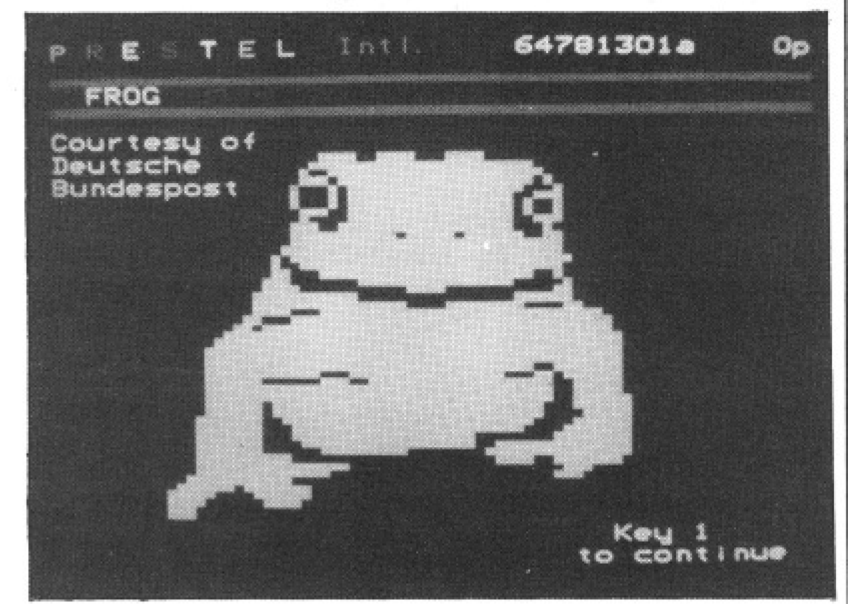
One of the useful features of Prestel is the ability to send electronic mail to other Prestel users. This has the obvious advantages of being much faster than the old-fashioned methods, not requiring you to find an envelope (let alone a stamp of the correct denominations), and working at any time of the night or day. Of course you are limited to communication with other Prestel users, although the number of these is at last starting to increase as interfaces are appearing for many popular home micros. The MAILBOX MENU is simply selected by pressing key 7, and displays a series of options:

KEY	FUNCTION
1	SEND MESSAGE
2	PREPARE MESSAGE
3	SAVE MESSAGE
4	LOAD MESSAGE
0	GOTO MAIN MENU

Messages may be typed directly from the keyboard, but it is better to create and edit your message in advance. In this mode the start and end of the available message area are indicated by ">" and "#" which gives you an area of just over 500 characters. The keyboard acts as a normal typewriter, giving lower-case characters unless the SHIFT key is held down, and you can move around the field with the cursor keys. DOWN ARROW, rather than "ENTER" moves you to the next line and editing is achieved by destructive overwriting of existing text.

Once the message is complete, pressing SHIFT/UP ARROW returns you to the MAILBOX MENU. Messages can be easily SAVEd to tape, or reLOADed from tape with options 3 and 4 as before, whilst option 1 allows you to automatically SEND your prepared message to any other user (if you know their number). Provided that you remember to leave Prestel via the ▶





Micro Resources' Prestel unit is monochrome only (so don't be fooled by this month's front cover – that's artistic licence)

◀ LOG OFF option you will be advised of any messages waiting in the mailbox.

Telesoftware promises to be a growth area in the future. After all, what is the point in trudging around the shops trying to find a copy of a new release if you can simply ring up a supplier who can send you the program down the line immediately (but of course charge you for it at the same time!). You select the program which you want to DOWNLOAD from a menu on the telesoftware pages and then choose the DOWNLOAD option on the MAIN MENU which searches the header frame for the title. Once this has been found you are prompted to set up your cassette recorder and the download proceeds automatically. Each appropriate frame is fetched in turn and then saved on to tape as an ASCII file (as if you had used the standard Dragon Basic CSAVE"", A command).

If all goes well and the frames are received without corruption then you can reload the program from tape with CLOAD as usual (and also CSAVE it again in the normal compressed format). Comprehensive error checking is included in case of corruption during transmission, and the software automatically makes up to three attempts to copy each page. In the event of severe corruption, an error message is displayed, downloading is aborted, and you are advised to re-dial Prestel.

The Micro Resources' Prestel unit is a very professional product and the well-designed software is easy to use with very clear user-friendly prompts. The only real drawback to it is the monochrome display, but if you are keen on Prestel you should perhaps be thinking about buying a dedicated system instead. It adds yet another facet to the possible uses of your Dragon, at a reasonable price. But at the moment it still leaves you in the old "chicken and egg" situation with regard to telesoftware, as until there is an established core of Dragon Prestel users to support, there will not be any available! ■

Learning to love machine coding

Coming down from high-level languages –
***Stuart Sampson** gives an insight into the machine coding world . . .*

WHY DO PEOPLE insist that machine code is difficult? Why do experts insist that programming should be done in the highest level language possible? What is machine code anyway? Let's throw some of these phobias out the window and tell the Basic user that he has been using a machine code alongside Basic without knowing it.

You don't believe me? Then what sort of high level language is:
PLAY "03;1;3;5;6;8;10;04:1" or
VDU (28,121,0,0,0) or even
COLOR 2
A real high level language should recognise PLAY C MAJOR, or at least accept RED. In fact many micros accept Basic instead of numbers to program the microprocessor, but still expect the user to program the peripherals chips via numbers, ie in machine code.

Numbering

It is this use of numbers that gives computers, and machine code in particular, the reputation of being difficult. The very use of the term "code" implies an understanding barrier. Say after me "machine language". That's better, at least we can think of French rather than Enigma.

Those who have grown to remember the meaning of the numbers used by Basic have no excuse for not attempting to use machine language. In fact it is less numeric when you use an assembler — to such an extent you don't even have to remember line numbers, you can point to parts of the program using meaningful labels!

However, you do need to grasp some of the principles of the notorious microprocessor to get it to sing and dance. (What on 40 legs?) The microprocessor spends much of its time like a Post Office sorter, putting items into pigeon holes. Let's imagine a demonstration model. Prepare a rack of little pigeon holes, open both sides, and a pile of wooden cubes that fit the holes. For a true model of an 8-bit processor system the rack should be 256 long by 256 high, but a smaller one will serve to illustrate the principles. We will also have a marker to write on the cubes any number up to 255.

The numbers written on the cubes are the *data*, the holes represent memory *addresses* that the processor can attend to. To make your model more realistic you need to put certain numbered cubes into a few rows of holes, then cover them with a sheet of glass. This represents ROM, Read Only Memory. You can see the numbers but cannot change the cubes. Other rows must be covered also as there is no usable memory in these areas of the rack. Open holes represent RAM. Your rack is now becoming a *memory map*.

You now take the part of the processor, let's say for example a Z80. You start at address zero and start reading the numbers. The chances are that this area is under glass, and contains *instructions* that form the beginning of the *operating system*. To get going they may tell you to copy some data into RAM. On our model the ROM will inform you of an address to find the data, in terms of two numbered blocks. The numbers tell you the count of columns and rows to get to the first cube carrying the data. You will write these on a notepad, your *registers*. The instructions will also tell you the address in RAM to copy the data to, and you note this in other registers, and perhaps a count of how much data to transfer. Then you are instructed to move the data. A microprocessor never moves data, it copies it, so you look at the source cube, write the number on a new cube and put it in the destination address, causing anything in that hole to fall out the back.



Of course we assume the destination is RAM, ie read/write memory represented by open pigeon holes. If it is not, you cannot get the cube in and must discard it.

We can carry the model further by erecting a board behind the rack (spaced so cubes can fall when displaced). In this board we cut a window and call the area *video RAM*. As the processor puts cubes into it the user can see the back of the cubes, which carry the character whose ASCII code is the number on the front. We can also give the user lettered cubes which he puts into a pigeon hole representing the keyboard. The processor looks at this to accept the user's input.

This model may seem frivolous, but it illustrates the principles of memory mapping, ROM, RAM, moving by copying, the destruction of data when RAM is written to, what happens if you write to ROM, the fact that not all the map has useful memory, and the action of memory mapped displays. With the model in mind let us think briefly of the hardware.

Hard facts

The processor handles numbers between 0 and 255, hereinafter called bytes, as on/off signals on 8 wires called the *Data bus*. It also has 16 wires to select an address, called the *address bus*, and a *control bus* to send signals for read/write, etc. The term bus is a collection of wires carrying *binary* signals. Connection to all these can be made via the computer's expansion port, and they go to ROM, RAM, sound generators, VDU chips, etc.

Inside the processor these buses are connected to a vast array of microelectronics, which thankfully can be represented as a small number of blocks in a "programmer's model".

At this point one should realise that all I have said applies to the majority of processors used in personal computers, but once inside the processor one must expect differences. However, there are some common points:

- All processors have a register called a *program counter*, which is used as a bookmark in the program of instructions. It carries the address of the next instruction to be obeyed.
- All processors have at least one *Accumulator*. This is where data is stored before number crunching, and it holds the answer afterwards.
- All processors have at least two more registers that are generally used as a scratch pad or for noting addresses in some form.
- All processors have a *stack pointer*. This is used to point to an address in an area of memory called a *stack*. This is an external scratch pad in which data is handled on a Last-In-First-Out basis. I will be explaining the use of this later.
- All processors have a flag or condition code register, which is really a collection of YES/NO memories reflecting the more important aspects of the last operation. The state of these can then be used to affect future events. As all useful programs involve getting the computer to act in response to certain conditions, the use of these flags is at the heart of machine language programming.
- Of course all processors have an ▶

The mutterings of your Dragon

. . . and teaches you how to understand Dragon talk

SOME OF US humans tend to mutter away while thinking out a problem. Have you ever heard a Dragon doing this? Well, those who claim it uses Welsh haven't got superhuman hearing after all. The Dragon mutters in 6809 machine code.

Sooner or later most of us learn that microcomputers like the Dragon are just a bundle of memory supervised by a microprocessor (CPU), with a keyboard and video system added on so us humans can interfere with it. In the Dragon the CPU is a 6809E, and this has its particular language for its thoughts. Other micros have Z80s, 6502s or other CPUs, each with its own machine language.

"What about Basic?" I hear from the back row. "What about Forth," I answer, "or any other high level language for that matter."

Basic speaking

Micros are "taught" these languages, just as we learn our way of translating thoughts into words. The Dragon is taught Basic at birth, by having some of its memory filled with a permanent dictionary, the Basic interpreter in ROM. It can use Forth if you teach it so by loading in a Forth compiler into RAM. Some business micros have no high level language, all they know when switched on is how to read a disk.

Back to Basic, and your Dragon's mutterings. What would you hear when it is running a Basic program?

Let us take an example where you have destroyed an enemy ship in a game and have scored 200 points. You are player 1 and your score is variable S1. The program may say:

500 IF HIT = 1 THEN GOTO 600
600 S1 = S1 + 200: PRINT S1

The English gist of the Dragon mutterings will say:

- Find line 500: first token is IF: look for this in KEYWORD list: It does feature therefore no syntax error: it is in nth position: look up nth director address: goto this routine: expect expression: expression found so no error: look up HIT in variable names table: found so no error: find corresponding value: should equal 1: true so search line for THEN or GOTO taken: THEN found so no error: read next token: GOTO read: search keyword list: GOTO found so no error: look for routine address: execute: evaluate 600
- Look for line 600 in program statement table: first character not token so try LET routine: Look for SI in variable names: found so no error: next character is = so no error: expression follows so no error: look for S1 in variable names: found so no error: read value: next character is + so evaluate 200 and goto ADD routine: store answer as new value for S1: look up PRINT in keywords: found so no error: find routine address: is following character a quote?: no, so numeric expression expected: goto evaluation routine: look up S1 in variable names: found so no error: find cursor position: call decimal conversion routine for first digit: write to screen memory at cursor position and advance one: repeat tall number written: read program statements for next line.

"What's all this token business?" I hear from the back row again. Well, most micros handle data as Bytes: machine language is bytes, characters are bytes, numbers are combinations of bytes. A byte is a numerical unit with a value from 0 to 255. In the case of characters, the ASCII code is used which allots numbers up to 128, leaving 128 possible values free. When storing a program the Dragon uses its keyword table to recognise Basic words and converts these to tokens of values 128 through 255, which act as shorthand saving space in the program statement table, that is to say your program in RAM.

In spite of this shorthand, the Dragon has to look up what to do every time it sees a keyword, and keeps on checking for errors, so Basic is slow.

Direct talk

What would happen if you could break in on these mutterings and tell the Dragon what to do in its own language? Let's say to it:

- Read from workspace 1 (HIT): compare with 1: if equal set accumulator to 200 and goto score increase routine.
- Add into accumulator contents of workspace 2 (S1): store into workspace 2: fetch cursor position: derive decimal digit and store at cursor: advance cursor and repeat till number complete.

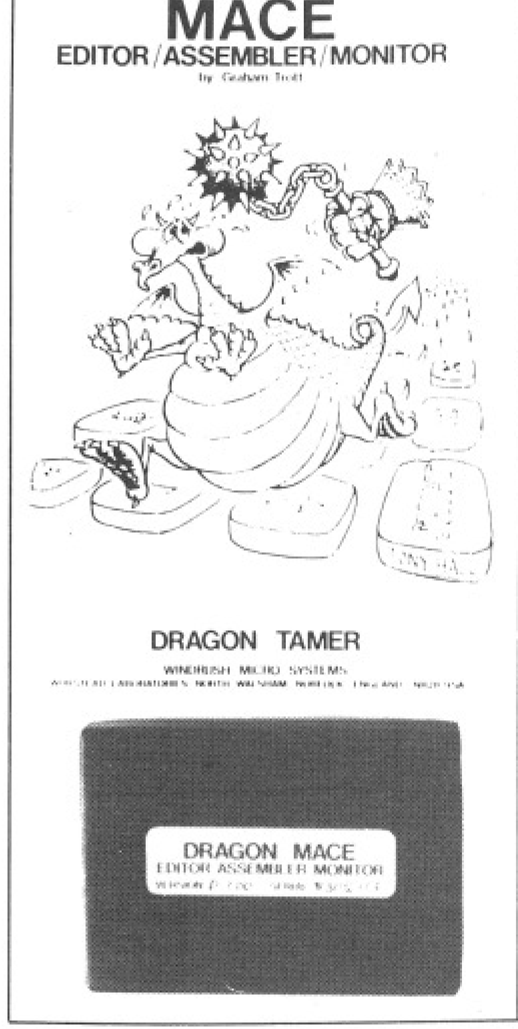
This is a lot quicker and shorter because you told the Dragon directly what to do, it does no looking up, and no error checking. But if you told it wrong, beware the consequences.

However, the actual instructions you give are a string of numbers, which have no meaning to the average computer literate mortal, nor to a Vic20 or a TRS-80 Model 3, whereas the Basic version would. It's pure Dragon mutter, but there are ways of making it more intelligible.

"What do interceptors, compilers, assemblers and monitors have in common?"

"Well, they are machine-code programs to help you write programs, and they are all things the beginner should have no need to be aware of to pursue his programming." Let's look at their uses, advantages and disadvantages.

The Dragon has a Basic interpreter that tells it how to go about executing a list of Basic statements. It reads them, looks up what to do, informing you of



Several assemblers are available

errors, and executes some standard routines in consequence, without ever learning or improving the program. It is ideal for program development, as you get immediate response from what you do.

If you had a Basic compiler you would have to write your program then compile it before it could be run. The compiler does all the looking up once, converting your text into a list of machine-code routines to be executed in order at a later date. It checks for errors and you have to correct them and compile again, until you have a program without any "I don't understand" errors. You might still get "run time" errors, eg division by zero, which might be detected by the run-time supervisory program supplied with the compiler. The compiled program runs faster and more efficiently, but is still limited by the structure of Basic.

Assemblers

Several assemblers can be bought for the Dragon. An assembler accepts assembly language rather than Basic and produces a machine code result. Assembly language is really sugar coated machine code. Each machine code instruction is expressed as mnemonic, ie a word you can remember more easily than a number. You write them in order, without regard to line numbers as reference points, but by including labels you can show the execution where to go when it needs to go out of sequence. You can give values to numbers and strings and refer to them by names, but even so your program needs to tell the CPU what to do at the level of simplicity of its own language.

A monitor is your access directly to the memory. You must write numbers into the memory cells directly. You can write machine language or data. A monitor is also needed as a run-time supervisor for testing machine language programs, either entered as numbers or via an assembler. It can diagnose the state of memory and CPU registers after a run, just as you might put STOP in a Basic program, run it and print out the variables to corner a bug.

So we have four levels of programming difficulty, each giving a bit of extra performance: the interpreter being the most accessible; the compiler allowing Basic to execute in machine code form, once debugged; the assembler giving a more accessible way of entering machine code; and the monitor which is needed to test machine code and can accept it in numeric, usually hexadecimal form.

"Hexa- what?" from the back row.

"Hexadecimal is just a way to express a byte in two characters, for four-toed sloths who can count on both hind and fore feet, or us if we take our socks off and ignore thumbs and big toes. Label your fingers and smaller toes from 0 to 9 and those left over A,B,C,D and F. Now rather than counting up to 99 in two goes, we can reach FF, ie 255 in decimal."

"You said each stage gives extra performance. How does writing on a monitor improve on an assembler?" asks the bright one at the back.

"Not a lot, really, but if you have limited memory in which to keep assembler, monitor, your mnemonic list (called source code) and the machine language (object code), you can't tackle the big stuff."

"What's the answer then?"

"Well, in hex it's 2A, for those who read English SF, but seriously, it depends on your ambitions. If you are out to write real-time games for the market, I would advocate really getting to grips with machine code and find a monitor with full bells and whistles. There is at least one which accepts mnemonics singly and works out displacements, so you get some assembling without clogging three-quarters of the free space with source code."

"Where do disassemblers fit in?"

"These help you out of the hexadecimal blues. They can recreate assembly language from object code, but of course they cannot invent the imaginative labels you might have used to find your way round the original. Bad cases of hex blues happen when you get used to assemblers and then you have a bug that forces you to examine memory with the monitor."

"Are you seriously recommending learning 6809 code in hexadecimal form?"

"Not outright, but it comes with use if you let it, just as with any foreign language, even Welsh I suppose! I learnt Z80 code, and have now got a good grounding in 6809 with a little help from a crib or two, and being able to read it off a hex dump display certainly helps in times of trouble. Also writing in hex saves a lot of typing, and you can see much more of it in a screenful."

Masochism?

"You must be one of those Masochist Macho Machinecodists then, that serious programmers despise when then advocate using the highest level language possible."

"Agreed. Their technique is great for complex business problems. Heavy arithmetic is a pain when the greatest accomplishment of the 6809 is to multiply two unsigned bytes together, and readability counts for a lot. But somebody has to write interpreters, operating systems and the like, and the public like games."

"We're told Basic is an unstructured language, what about machine code?"

"Machine code is as structured as a pile of bricks, but you can build how you like. Structure implies form, ie limits. With machine code you can write small routines, link them into larger ones, and them into a whole, or you can start at the beginning and try to reach the end with as little deviation as possible, it's your choice."

"Try a bit of Dragon muttering, it's worth it." ■

◄ *instruction decoder* and *ALU*. The latter is responsible for arithmetic and logical operations, coming between the instruction decoder and the accumulators. I use the plural because all processors use a temporary accumulator as well as the main one. The programmer need not worry too much about these last circuits on his model.

Vital knowledge

What the programmer needs to know to program in a processor's machine language falls into three main parts:

The processor's *instruction set*, the vocabulary.

The processor's internal memory layout, the *registers*.

The computer's *memory map*.

You will also need to know a bit about I/O (Input/Output) which covers keyboard, joysticks, graphics, sound, cassettes, etc, most of which form part of the memory map.

The other concept you need to get straight is the use of the *byte*. A byte is a whole number between 0 and 255, and consists of eight bits, which can be 1 or 0. The byte is the smallest unit of data the computer uses, and can be likened to a figure in a number. Our figures can range from 0 to 9, and to represent larger numbers we use two figures, multiplying the first by 10 and adding the second, and so on with further figures. The computer does this too, but with numbers to the base 256 it needs very few bytes to cope with the biggest numbers we ever need. Addresses are just two bytes and range from 0 to 65,535.

In fact we find that for many programs we rarely bother with more than two bytes at a time, particularly in machine language. The byte is very versatile, it can represent many things, such as:

A boring old number

A text character

A graphics character

A colour, or even "paper and ink" colours together

A group of picture elements in hi-res graphics

A graphics point co-ordinate

A machine language instruction (or part of one)

The operations that can be performed on these bytes are called 8 bit operations. They fall into three main groups:

Copying to transfer — LOAD = Memory to Register, STORE = Register to Memory, TRANSFER = Register to Register (in Z80 parlance all are called LOAD)

Single byte operations — INCREMENT, DECREMENT, NEGATE, COMPLEMENT, SHIFT, ROTATE, etc

Two byte operations — ADD, SUBTRACT, AND, OR, EXCLUSIVE OR, COMPARE.

Single byte operations can be done on bytes in registers or memory in isolation. Two byte operations almost always are done with one byte in the *accumulator* and the other in a memory or, for "80" type processors, in a register. The result is to be found in the accumulator.

All processors can also do 16-bit ►



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◀ addition, though in some it might be confined to deriving addresses, and all can perform some form of 16-bit transfer, albeit as two adjacent bytes.

I have now listed all but one group of operations of the average processor, and you might be excused for wondering what all the fuss is about. In fact you might wonder how such simple operations can result in the marvels your computer performs, particularly when loaded with a machine-code game program. The answer lies partly in the group we have yet to discuss, but the main reason is the tireless speed at which the operations are done. Just think that every time your cursor gets to the bottom of the screen scrolls, and the processor has to read every individual character and write it to the line above. Do you perceive it as taking time?

I have said that all programs of any value require the computer to choose a course of action as a result of a previous operation. Normally the processor reads instructions from the program and executes them in order, using the *program counter* (PC) to follow the sequence. Suppose some operation upsets the progression of the PC, and loads it with a new value. The next instruction will be read from a different part of the program and a JUMP or BRANCH operation will have occurred.

This may mark the end of a particular sequence or *routine*, in which case the jump will always happen, but all processors have the ability to perform *conditional* jumps or branches. When one of these is encountered the progression is only disturbed if a particular *flag* is set or cleared. This of course depends on the result of some past operation.

Flying the flag

There are four flags that form the mainstay of conditional branching, and it is vital to know which are affected by which operations. The simplest is the *zero* flag. This is set when the result of an operation is zero, and often marks the completion of a sequence of loops, or that a particular condition is met, having compared two bytes and finding they are the same. From this derives the terminology of some processors — "BRANCH IF EQUAL" meaning "if the ZERO flag is set".

The *carry* flag marks carry or borrow in arithmetic operations, just as we do with our sums. This can be incorporated in the next arithmetic operation or used to control a branch. *Carry* also holds the bit shoved off the end by *shift* operations.

The *minus* or *sign* flag reflects the state of Bit 7 of the result, which is understood to mean *negative* if we are dealing in *signed arithmetic*. Rather than regard a byte as a number between 0 and 255, this notation allows it values between −128 and +127, and the upper bit is set for negative numbers.

Unfortunately the *minus* flag can be misleading, for instance if we add +115 to +125 we get +240. However, the byte representing +240 in normal notation has its upper bit set to 1, and would appear to be negative (−16) in signed arithmetic. To cope with this, processors have an *overflow* flag, that warns that the minus flag is lying if it results from a signed arithmetic operation.

Conditional jumps are at the heart of the program structure, and usually harbour the bugs in your program. Either it jumps for the wrong condition, or to the wrong place, sometimes missing a valid instruction altogether causing a self-destructive crash. This is where many take their bat home and return to Basic, with its now comforting error messages.



Another variety of jump type instruction involves subroutines. These are jumps that divert to a much used part of the program and expect to return to the main sequence where it left off, exactly the way GOSUB works in Basic. In order to do this, the address of the next instruction of the sequence has to be stored before the value in the PC is replaced to cause the jump. This is where the *stack* comes in.

The stack is RAM used as a fast dumping ground where data is stored and retrieved on a sequential basis, Last-In-First-Out. It is managed by the *stack pointer*, which holds an address that automatically points to the most recent data put into the stack. The stack can be likened to a spring-loaded plate dispenser, or rifle magazine — if you put something in, you have to remove all you put in after it to get it out again.

In the case of subroutines, the *jump* or *call* stores the address of resumption, the *return address*, on the stack. When the subroutine is finished, the return instruction withdraws the return address from the stack and puts it back on the program counter, causing execution of the program where it left off. In many cases you may want to preserve the contents of some other registers from destruction by the subroutine. The stack can be used for this too: you *push* the register contents into the stack, a store operation under management of the stack pointer. To retrieve them a *pop* or *pull* is used (as suits your processor's parlance, some seem to have a stronger spring than others!).

We can go a little further before the character of the processors stops us talking generally, and cover *addressing modes*. These do vary from one processor to another, but there is the *effective address*, which just means that 16-bit value that squirts out of the *address bus* when accessing memory. The 6809 lets the programmer grab it as a value, others just use it to select memory. How the EA is derived depends on the addressing mode of the instruction, and is always derived from register contents directly or indirectly.

The simplest form of "addressing mode" does not involve an EA at all, as it covers operations on or between internal registers of the processor, and is sometimes called *implied* or *inherent*. The register identification is implied by the code used for the instruction itself.

The next simplest is the *immediate* mode. Here the data is built into the program immediately following the instruction code (*op-code*). No store or single byte operations are allowed in this mode as they would affect the program itself. The EA in this case is derived from the contents of the program counter. Some 16-bit operations can also be immediate.

Extended addressing is where the address rather than the data follows the op-code, so the processor has an extended operation to do.

Some processors take this one stage further, *extended indirect*. The data found as above is actually the address to find the data you want. In fact some processors boast indirect versions of other modes as well and life can get very confusing to those without a clear head.

The push/pull/pop operations can be thought of as a special addressing mode, deriving its EA from the stack pointer. It allows data transfer only.

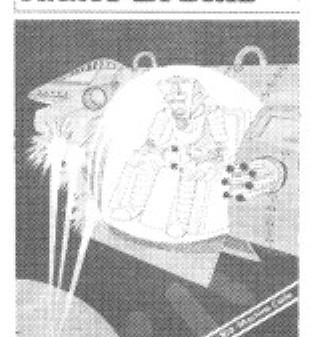
Registering

All processors have some *register* addressing modes, where the EA comes from a register other than the PC or SP. These are most useful for table and screen processing. Most processors have simple register addressing, and a version called *indexed* addressing where the EA is the register contents modified in some way. The most common is where the op-code is followed by *displacement* data which is "added" to the register contents to form the EA. This mode can be used for the screen scroll: the register holds the address of the character to be moved, and it is loaded into the accumulator using the register addressing mode. The character is stored one line higher using the indexed addressing mode with a displacement of minus one line's worth. The register content is then incremented to point to the next character and the process repeated.

We now know something about what the processor can do, and how it knows what to do it to. We have both dimensions of the processor's *instruction set*. We also know that each instruction is provided as a byte (or sometimes two bytes) in the program, often followed by data, displacement or address, and how the program counter keeps track of progress through this jungle of numbers. But how do *we* cope with the jungle?

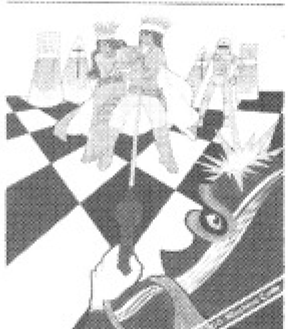
This is not obvious on many home micros, and seems to present another barrier to machine language programming. Often we need to buy extra software just to bypass the Basic interpreter in order to speak to the processor direct (see the accompanying article). It's as bad as a boss surrounded by secretaries telling you he's busy. ■

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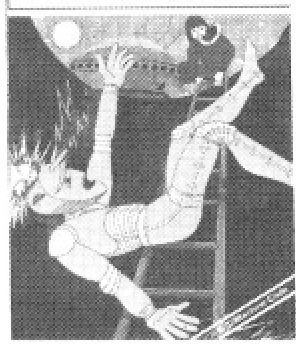
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Animation is easily implemented with DRWG function which swaps the drawings being used for sprites and they needn't even be the same size.

Some of the commands are exceptionally powerful . . . MOVEn moves a single sprite, MOVEn,n moves a block of sprites, MOVEM moves all the sprites. All the MOVE commands observe the individual direction, screen-edge, joystick and keyboard instructions for the various sprites. The REPORT function reports how many have crashed. The HIT function reports crashed sprite numbers.

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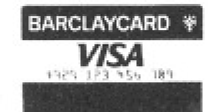
Keyboard handling has had some attention too . . . optional auto-repeat, INKEY function returns ASCII code, KEY function does the same, but waits for a keypress. CLEAR key clears hi-res screen and homes the print cursor.

We have also included a couple of routines to provide text on the hi-res screen . . . in all 5 PMODES with enhanced cursor controls providing relative as well as absolute positioning, PAGE command, HOLD command (to fix headers or graphics), COLOUR command changes text foreground and background colours etc. The hi-res screen is used just like the Basic text screen, including editing. You can also re-define the character set using the friendly new command CHR(n)=eight row values.

Sprite Magic requires absolutely no knowledge of machine code. The comprehensive manual describes the new Basic commands in full, with lots of examples. As well as the documented demonstration program, the cassette includes Character and Sound Generators, Mate in two (yes you can!), Shooting Gallery and Breakout. Price £17.25 all inclusive.



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Moving up with OS 9

***Keith and Steven Brain** reveal the ins and outs of OS9*

AT LAST Dragon Data's long-awaited OS9 disk operating system and range of associated software have arrived on the scene as part of a deliberate policy of moving "up-market" into the small business and professional sector where Dragon Data sees an expanding user-base.

It remains to be seen whether small businessmen can be persuaded to part with their hard-won cash for such business aids, but at the same time the arrival of OS9 is a major step forward for the computer enthusiast who wants to squeeze the most out of his Dragon. Certainly Dragon Data's pricing policy seems to be firmly based on the "pile it high and sell it cheap" axiom on which Tesco was founded, and in comparison with many professional programs for other micros its software prices seem to offer extremely good value.

A serious system

If Sir Clive hadn't thought of it first (as usual), we would be tempted to say that this step was a "quantum leap" for the Dragon as it effectively transforms the micro from a sophisticated toy into a very serious machine.

The OS9 operating system is the key to the expansion of the Dragon's potential and to fully understand the significance of this development it is necessary to consider how a computer carries out instructions. In the standard Dragon 32 or 64 the "operating system", which contains the commands understood by the computer, is contained within the Basic ROM. If the Dragon DOS disk system is added further systems routines are included in ROM in the cartridge. All of the routines in these ROMs are actually included in the memory map at all times, whereas with a totally disk-based operating system all of the routines are on disk instead, and these are only loaded into memory as and when required. The immediate advantage of this is that you can have a much more complicated operating system without losing much of your precious RAM.

OS9 is a sophisticated management system which enables you to get much more from your Dragon. As it was designed by Microware Systems Corporation in collaboration with Motorola (the designers of the 6809 CPU), it is an extremely efficient product which uses the capabilities of the 6809 to maximum advantage. A major difference between the 6809 CPU and lesser microprocessors is that it supports "position-independent-code (PIC)" which means that routines can be loaded and run at any point in memory. Thus the available memory can be used much more efficiently, and several programs can be present simultaneously.

In practice OS9 carries out all of the housekeeping for you automatically without any need for intervention from the user (unless you attempt the impossible). Normally modules are loaded as required and then deleted from memory once their usefulness is ended, but where modules are called repeatedly these can easily be locked into memory to save time. A substantial *OS9 Operating System User's Guide* is included and an *OS9 Programmer's Manual* (unseen as yet) is listed at £19.95. The details of OS9 are too complex to explain in the small space available here so we will try to give you the flavour of the system and point out what we feel are the most significant features as far as the Dragon implementation is concerned.

To run OS9 you need a Dragon with 64K of RAM and a Dragon DOS disk system. When you use OS9 you turn your Dragon into a 64K "soft machine" and switch out both the standard Basic ROM and Dragon DOS, although you need the latter to set this process in motion. You turn on the Dragon as usual and when the Dragon DOS logo appears insert the OS9 system disk and enter the command "BOOT", which loads the essential control modules into memory and sets up 64K of RAM. These essential routines are concerned with items such as input/output (I/O) management, disk control, keyboard scan, video display, printer and real time clock. At this point you have 48K of memory still free for use.

The "shell" is the part of OS9 which accepts commands from the keyboard and acts as the interface between you and the rest of OS9. Whenever the shell is waiting for an input the "OS9" prompt is shown at the start of the next line. The command line always starts with the name of the program to be run (which can be one of several different types) and once the line is entered the shell searches for this name, first in memory, next in the "execution directory", and finally in the user's "data directory".

There are many similarities between OS9 and Unix, and pathlists are an important concept. These are descriptions of the route to be followed by a command and are somewhat similar to the "filenames" used by other systems, except that they frequently consist of a list of names rather than just a single name. Multifile devices (like disks) store data in separate files which have names that are entered in a "directory file". When a new disk is first formatted a "root directory" is created automatically, and sub-directories are formed beneath this in a tree-structured hierarchy.

For example, the root directory of the standard OS9 system disk contains seven files: OS9Boot, CMDS, DEFS, SYS, startup, RUN32 and RUN51, and the CMDS directory contains a further series of files which contain the modules for 47 individual OS9 commands. It is sometimes a nuisance to have to specify a complete pathlist to call up a particular file, but this is often unnecessary and only a relatively minor irritation.

The default startup file uses the normal Dragon text display, with upper-case letters only, but both upper and lower-case (inverse) can be called with "-UPC", with or without shift-lock. A number of control functions can be called by codes or via the "clear" key, and a "type-ahead" buffer operates except when the disk drive is running. An alternative video driver producing a 51 column by 24 line true upper and lower case display can be called by "9051". However, although preferable, it does eat up 6K of memory.

Modes and codes

Two hi-resolution graphics modes are supported (=PMODE 3 and 4) and codes are available to produce the equivalents of PMODE, COLOR, PSET, PRESET, PCLS, MOVE, LINE and CIRCLE. But the very useful DRAW, GET and PUT are notable by their absence. Joystick values can be called via assembly language system calls.

OS9 has a unified I/O system in which transfer of information takes place in the same way regardless of the hardware device involved. This means that I/O can easily be redirected to alternative devices without having to alter the program. (For example, to divert output from the screen to the parallel printer port all you need to do is to add ">/P" to your execution command instead of changing every occurrence of "PRINT" to "PRINT#-2".) This also means that programs are highly portable from your Dragon to any other computer using the 6809 CPU. The "ACIA51" module redirects input or output to the serial port, and this can be used, for instance, to drive a serial printer or to transfer data from another device (such as another Dragon). No cassette driver routines are provided.

If more than one program is entered on the same line, separated by semicolons, then these programs will be executed strictly in sequence. The second kind of separator is the ampersand (&) which denotes concurrent execution (two or more programs running simultaneously). Much of the time the CPU is simply waiting for some input and the efficiency of OS9 is much enhanced by "timeslicing" which allows different processes to share CPU time and other resources.

Management is carried out automatically but specific priorities can be applied to different processes if desired. As an ▶



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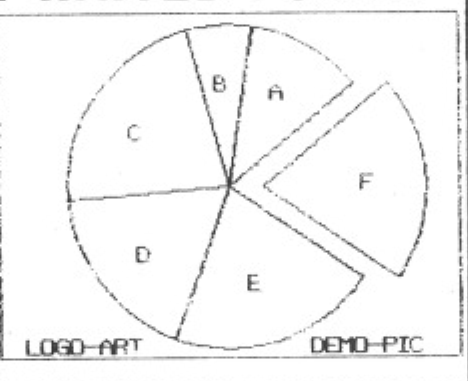
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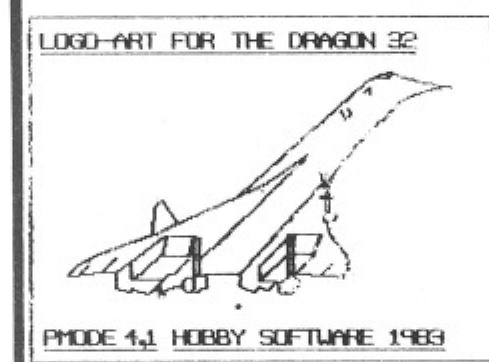
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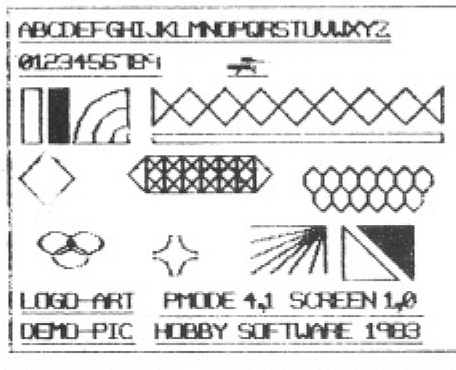
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example entering "DIR>/P&" will show a process ID number (for example, 001), start to print out a directory to the printer, but immediately return the OS9 prompt so that another command can be entered. The final type of separator (!) sets up "pipelines" between concurrent programs so that the output from one automatically becomes the input for another with perfect synchronisation.

Ownership

OS9 will support timesharing between a number of terminals and the LOGIN command can also be used on the standard system to check for the correct password before entry is allowed. Every file has ownership and attributes which determine who may access the file and how it may be used. The current user number is automatically added to the file, and execution, reading and writing can be restricted to this user. Finally we must mention the OS9gen and Cobbler commands which allow you to change the system boot configuration to suit particular applications.

Undoubtedly OS9 is a very valuable tool, the power of which is well demonstrated in the applications software described below.

Basic 09 is described as "an enhanced and structured Basic language programming system specially created for the 6809 advanced microprocessor used by the Dragon computer". In fact Basic 09 is rather a Basic/Pascal hybrid with an odd bit of Fortran thrown in for good measure. One very important feature is that it has an interactive compiler which gives it the speed of a compiled language and the ease of use of an interpreted language.

Although Microsoft's Color Basic (the standard Dragon version) is extremely easy to use and is noted for its excellent graphics commands, it was not written for a particular processor whereas Basic 09 was especially written to exploit the full potential of the 6809. Basic 09 is fully compatible with other programs running under OS9 so that you can use it to process files produced with the database package RMS, Stylograph and others.

Basic 09 is made up of some 22K of code and on startup 4K is reserved for workspace, although this is easily changed with MEM up to a maximum of about 24K. On startup it is in SYSTEM mode where you can interact with OS9 and control the workspace environment. Programs are written and amended in EDIT mode, the language is fully structured, and programs are written as procedures where line numbers are optional. A syntax check is automatically made at the end of each line and in addition a further error check is performed when the procedure is complete. Provided that no errors are found the program is immediately compiled to Intermediate ("I") code which is executed by run-time routines.

When an existing procedure is edited it is automatically decompiled and the "I-code address" of each line is printed out so that the position of errors can be easily located. Program listings are automatically "pretty printed" to show nesting. A wide range of editing commands (including search, change and renumber) are provided. Standard control structures are supported, in addition to WHILE ... DO, REPEAT ... UNTIL, LOOP ... ENDLOOP, IF ... ENDIF and ON ERROR GOTO are supported.

Programs can be simply RUN by name or AUTO-RUN allows immediate execution after loading. If errors are found then these are dealt with in the comprehensive DEBUG mode. In particular BREAK allows you to set up breakpoints, STEP executes a procedure one source statement at a time, and STATE lists the nesting of all active procedures. TRON turns on trace mode where the compiled code of each equivalent statement line is reconstructed to source statements and displayed before the statement is executed.

The PACK command allows you to further reduce the size and execution time of your program by forcing another compiler pass which removes names, line numbers, non-executable statements and so on. But once the procedure is in this form it cannot be edited, debugged or reloaded into the workspace, although the code can be run from OS9 at any time and is secure. Speed-up in the order of 10-30 percent is claimed, but that rather depends on how much unnecessary material there was in the original version!

A Graphics Interface Module ("GFX"), written in assembly language, is provided to give easier access to the hi-res facilities described under OS9 itself. In addition to the facilities mentioned previously there are GLOC (returns the address of the video display RAM), GCOLR (=PPOINT) and JOYSTICK (as Color Basic). No sound capabilities are included (apart from BELL).

OS9 has very powerful mathematical functions and nine-decimal-digit, 40-bit-binary floating point arithmetic.

The TYPE statement can be used to produce a new user-defined data type which may mix the standard data types. As well as the normal Boolean operators (NOT, AND, OR and XOR) bit-by-bit logical operators are provided (LNOT, LAND, LOR and LXOR). Other functions include MOD (remainder), ADDR (memory address of a variable, array, or structure name), SIZE (size of a variable, array, or structure name), ERR (code of the most recent error), DATE$ (current date and time), and TRIM$ (removes trailing spaces from a string). The useful INKEY$ command does not appear in the manual (except as an assembly listing) although in fact it is actually present in the CMDS directory.

Files and I/O are dealt with in typical unified OS9 fashion. INPUT, PRINT, PRINT USING, CREATE, OPEN, CLOSE, DELETE, READ and WRITE are self-explanatory. GET and PUT statements are completely different from their Microsoft pseudonyms and read and write fixed size binary data records to files or devices whilst SEEK changes the file pointer. They are the primary I/O commands for random access and can be used to deal with individual records or whole data structures. As they use the same binary format as the actual disk files they are much faster than READ and WRITE which convert characters to and from ASCII format.

Speed measurement

Although we are not generally greatly in favour of comparing "benchmarks" for different machines, a quick check of the standard (Kilobaud) comparisons revealed such a startling improvement over standard Dragon Basic that we could not resist including them.

A quick glance at the comparison table shows what a real boost has been added to the Dragon. Even in the worst case (using real numbers) the speed improvements are dramatic (execution time reduced to 35 percent). If integer num- ▶

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	MEAN
DRAGON 64								
MICROSOFT COLOR	1.50	10.30	19.70	21.60	22.50	34.60	50.70	22.12
BASIC09 (REAL)	1.00	1.90	5.20	6.90	7.10	12.90	20.10	7.97
BASIC09 (INTEGER)	0.50	0.90	3.00	2.20	2.50	4.20	8.80	3.16
BBC B	1.00	3.10	8.30	9.70	9.20	12.90	21.90	9.44
COMMODORE 64	1.40	10.50	19.20	20.00	21.00	32.20	51.60	22.27
ACT APRICOT	1.50	4.90	10.40	10.90	12.20	22.80	35.50	14.00
IBM PC	1.20	4.90	11.70	12.20	13.40	23.30	37.40	14.86

Benchmarks: standard programs designed to measure the speed of particular processes on different machines

◀ bers are used wherever possible the results are almost unbelievable (reduction to only 14 percent of the original time). Comparisons with some other machines are also very interesting and demonstrate that 16 bits are no substitute for good software.

Complete package

The Stylograph word-processing program is only available as a complete package which also includes the Mailmerge and Spellcheck options, but as the total price is only £79.95 you can hardly complain about that. It can be used on a single or dual disk system, but on a single disk system storage space is somewhat limited as the extensive dictionary is on the same disk as the text files. A detailed manual is provided which explains the system quite clearly, and a step-by-step tutorial is also provided. The manual was obviously not written specifically for the Dragon and unfortunately the tutorial is very confusing in places as the examples given assume that the default screen display is wider than it actually is. (Stylograph uses a 51 column by 24 row display format but line length can go up to 160 characters and the screen can be scrolled left and right in 25 character steps.)

To use Stylograph, simply replace the OS9 system disk with the Stylograph disk, change the directories to the new disk (chx/d0/cmds chd/d0), move to 51 column mode (go51) and type "stylo" to enter "supervisor mode" where a menu of options is provided which are selected with a moving cursor. Text can be loaded and saved, backup files are automatically kept, and accidental deletion of files is difficult as comprehensive error traps are included.

The extensive printout capabilities will support virtually any type of printer (including proportional spacing) and any necessary modifications can be carried out at the time or on a permanent basis by calling the STYFIX program. Even when the system is configured for a special printer, supporting underlining or alternate fonts, a straightforward printout can still be produced by selecting the TTY option, and files can also be spooled to disk for later printing. It is possible to PASS any command to OS9 from within Stylograph, which is particularly useful if you want to call up a disk directory, for example.

Selecting EDIT takes you into the ESCAPE mode where cursor control, scrolls, find, replace, move, duplicate, delete, insert and single character overwrite can be carried out. A useful card showing the keyboard functions in escape and control modes is provided. The current page number is displayed at the top of the screen, together with a line of dashes to indicate the line length and you can easily jump to any existing page. The cursor control and scroll keys are grouped in the traditional diamond pattern, and hitting the semicolon takes you into INSERT mode, where text can be entered. It is obvious that you are in insert mode as the current line is now indicated with a row of inverted hyphens indicating the line length.

Full page formatting facilities are provided, and the effect of many of the commands is visible immediately on screen. Text may be unjustified, left justified, right justified, or centred and the input buffer and concurrent rewrite of the display mean that it is impossible to "miss" characters even when typing rapidly. Page headers and footers, new paragraphs and pages, margins and indents can be defined.

Control functions can be called from either escape or insert mode, with the "clear" key being used as control. CTRL-A calls assistance if you forget a command; CTRL-D, -W and -X delete characters, words or lines; -R sets tabs; -Y clears tabs and -T moves to the next tab position. Five different types of character modifications can be specified (provided that your printer can accept them): underline (-U), overline (-O), superscript (-I), subscript (-K), and boldface (-B). These are normally indicated by reverse printing of the text, but they can also be checked by the VIEW command (-V), which replaces the text with different numbers according to the modifications called, and all modifications can be removed with -Z. CTRL-F allows you to remove the format lines from the screen so that more text can be viewed, and -P shows the current status of the text.

CTRL-G allows you to insert "ghost hyphens" into long words. The final control function (-N) allows you to put a name (explanation) to any error you may encounter. Hitting the clear and break keys at the same time returns you to the escape mode.

To begin with we found that switching between insert and escape modes was a little tedious, but with practice this was not really a problem. The maximum memory allocation for Stylograph seems to be #15K which only gives a total of 8901 bytes for text storage (about six double-spaced A4 pages), which is rather small, but text files can be linked to produce longer documents. It is a very sophisticated system (the stylo file alone contains over 21K of code and 6K are needed for the hi-res text display) so there has inevitably been a trade-off between facilities and space.

The Mailmerge option has three functions. First of all it allows you to print any number of copies in a particular file. Secondly it allows you to link files together for printout as a single document with continuous page numbers, headings and so on. Finally it allows you to merge a file of "variables" with a text file. The most obvious variables are names and addresses for personalised circular letters but there are obviously many other applications. As OS9 is multitasking it is easy to set up Mailmerge as a background task which proceeds even as you are preparing another document.

If you can't stand the noise of your printer when you are working then you can simply divert the output to a comprehensive disk file which can be printed later. If you also have the RMS database you can use it to produce a file of specific data to be merged with the text.

Spellcheck

The final part of the package is Spellcheck, a very impressive program which rapidly compares each word in your text file with the contents of its dictionaries and reports any words which it cannot find for possible correction. The standard dictionary contains an amazing 42,000 words (Spellstar has 12,000) which are in a specially compressed format that occupies only a quarter of the space normally required. In addition it is easy to add new words (such as technical terms) to a supplementary dictionary.

If a "non-match" is found then the word is displayed and one of a number of options can be selected. You can simply (I)gnore the word or (A)dd it to the dictionary. On the other hand, if you are less sure of yourself, you can decide to (D)isplay it in context or (F)lag it for later action. In theory it is possible to decompress the dictionary to read the words but the normal Dragon disks are too small to hold the results. More usefully, it is possible to merge supplementary dictionaries into the main one to give more rapid checking of added words. As a sideline a wordcount is also produced during checking.

We hope this introduction gives a taste of what can be done with OS9 — other applications packages will have to wait for a later review. ■

```
(D0 ROOT DIRECTORY)

OS9Boot  CMDS  SYS  DEFS  startup  RUN32  RUN51

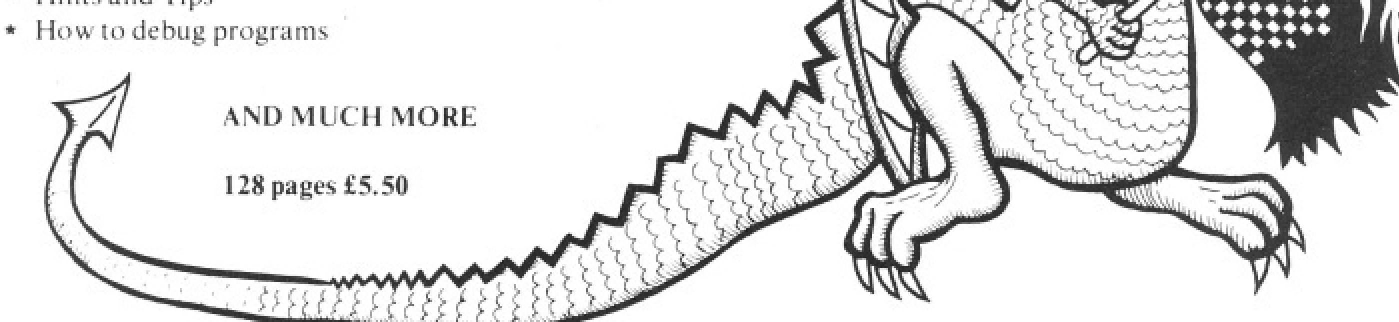
RUNB  attr  backup  binex  build  cmp  cobbler  copy  date  dcheck  ....
```

Figure 1: the disk operating system's directory structure

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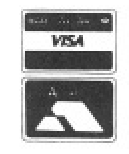
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Learning to experiment

***Peter Whittaker's** project for would-be experimenters*

HERE IS A project for all those who, like myself, want to experiment with their Dragons, but don't have the confidence to tackle complex circuitry. Rather than construct an A/D converter, I decided to use the Dragon's built-in A/D device. This means that you do not have to resort to machine code to program the lightpen. It is possible to connect a lightpen to the joystick port, and access it with the JOYSTK(0) command. Whenever you use the joysticks the Dragon converts the analogue signal from the joystick into a digital value between 0 and 63.

Figures 1 and 2 show the joystick port connections and the circuit diagram for a joystick. A constant 5 volts is applied to pin #5. After passing through the potentiometers' maximum setting the current returns to pin #3. Pins #2 and #1 read the input voltage returning from the variable setting of the potentiometers. By using the A/D converter to compare these voltages (#3 with #1 or #3 with #2) the computer calculates the position of the joystick. The joystick works by changing the setting of these potentiometers. To replace the joystick with a lightpen we need to include a photo cell in the circuit, and remove one of the potentiometers (figure 3). By leaving the potentiometer in a fixed position the computer will only register the voltage changes caused by differing light levels falling on the photo cell.

Use a trimmer for the potentiometer as this is very small. If a large potentiometer is used, it would get in the way and make the lightpen difficult to use.

Cut four lengths of wire to the desired length for the lightpen lead, and two pieces about four inches long. Solder a long wire to each of the pins #1,#3,#4,#5 on the DIN plug. Now connect:

Wire #1 to the centre leg of the potentiometer.

Wire #5 to one leg of the photo cell. Use a short wire to connect the other leg to one of the legs on the potentiometer.

Wire #4 to one of the legs on the switch.

Wire #3 to the other switch leg. Use a short wire to also connect this leg to the last leg of the potentiometer.

That is the wiring completed. House the photo cell in the tube, recessing it about two or three inches. Close the back of the tube to prevent back-light from interfering with the photo cell. Before plugging the lightpen into the joystick port, wrap electrical insulation tape around all bare wires making extra sure that there are no short circuits between any of the wires connected to the DIN plug.

When RUN the program displays all eight colours along the bottom of the screen, with a green surround (black can be obtained from the border). Instructions appear at the top of the screen. If the readings obtained are all clustered at one end of the scale adjust the setting of the potentiometer until a satisfactory range is obtained. Table 1 gives a list of values obtained using the lightpen, and illustrates the difficulty of telling some colours apart. To the lightpen, colours one and six and two and five are nearly identical.

If the lightpen seems to be reading completely the wrong colour from the screen make sure that you are giving the photo cell long enough to adjust to the light level before pressing the button. Alternatively, if the lightpen tube is not completely opaque, the shadow from your hand may be affecting the readings. When using the

1 Photo cell Tandy #276-116a 99p.
1 Miniature push button switch Pack of 5 Tandy #275-1547 59p.
1 Trimmer control (100K) (potentiometer) Tandy #271-220 79p.
1 5-pin DIN plug (270 degrees) to fit joystick port.
Four long bits of wire and two bits of wire about 4 inches long.
1 opaque tube to house Photo cell.
Total less than £4.00.

```
10 RESTORE:GOTO100
20 PRINT@416,"":FOR A=1 TO 2:FOR B=1TO8:FORC=1TO4:PRINTCHR$(127+B*16);:NEXTC,B:N
EXT:RETURN
30 A=0:FOR B=1 TO 100:A=A+JOYSTK(0):NEXT:A=A/100:RETURN
31 FOR A=0TO8:K(A)=A:NEXT:A=-1
32 A=A+1:FORB=A TO 8:IF LP(A)<LP(B) THEN 34
33 C=LP(A):LP(A)=LP(B):LP(B)=C:C=K(A):K(A)=K(B):K(B)=C:
34 NEXT:IF A<8 THEN 32 ELSE RETURN
99 REM SET UP LIGHTPEN
100 CLS :GOSUB20
110 FOR K=0TO8:READ C$:PRINT@32,"HOLD PEN TO ";C$;" SECTION":PRINT"OF SCREEN AND
 PRESS BUTTON."
120 GOSUB30:PRINT@0,"LIGHTPEN READING=";A:IF (PEEK(65280)<>126 AND PEEK(65280)<>
254) THEN120 ELSE LP(K)=A:SOUND100,1:NEXT
130 GOSUB31
140 PRINT"COLOUR READING","DIFFERENCE":PRINT#-2,"COLOUR","READING","DIFFERENCE":
PRINT#-2,"":FOR A=0 TO 8:PRINTK(A);"  ";LP(A),INT(100*(LP(A+1)-LP(A)))/100:PRINT
#-2,K(A),LP(A),INT(100*(LP(A+1)-LP(A)))/100:NEXT:PRINT"PRESS BUTTON TO CONTINUE.
"
150 IF PEEK(65280)<>126 AND PEEK(65280)<>254 THEN 150 ELSE CLS:GOSUB 20
199 REM LIGHPEN DEMONSTRATION
200 GOSUB30:PRINT@0,"LIGHTPEN READING=";A:PRINT"POINT LIGHTPEN AT COLOUR AND
PRESS BUTTON TO SELECT.":IF (PEEK(65280)<>126 AND PEEK(65280)<>254) THEN200 ELSE
 SOUND100,1
210 FOR B=0 TO 8
220 C=K(B):IF ABS(A-LP(B))<=.5 OR A<LP(B) THEN CLS C:GOSUB20:GOTO200 ELSE NEXT
230 CLSC
240 GOSUB20:GOTO200
299 REM DATA FOR COLOURS
300 DATA BLACK,GREEN,YELLOW,BLUE,RED,BUFF,CYAN,MAGENTA,ORANGE
```

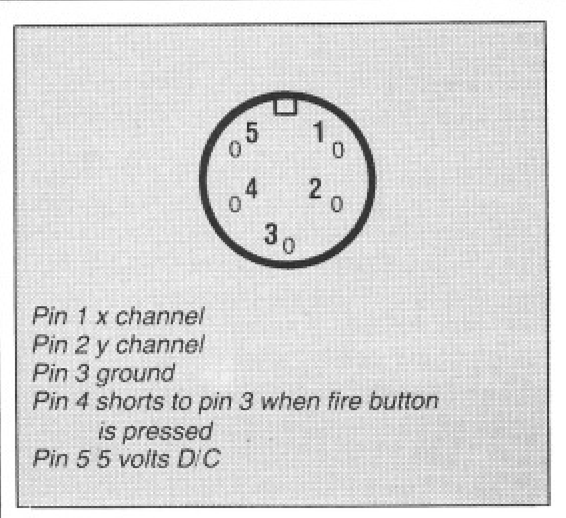


Figure 1: joystick port connections

lightpen with your own programs, the set-up stage can be omitted and the appropriate values for the different colours read from a data statement. To use the lightpen with machine code programs EXEC 48466 to update the joystick reading. The JOYSTK(0) value is stored at location 346. The program as listed is for the lightpen, plugged into the *right* joystick socket!

In the program line 20 prints coloured blocks to the screen. Line 30 reads lightpen values. Lines 31-34 sort values of lightpen readings in ascending order. Lines 100-130 input and set up lightpen values. Line 140 prints table of values to screen and to printer. Lines 200-240 are a demonstration program. Line 220 compares lightpen value to values in array of set-up values. ■

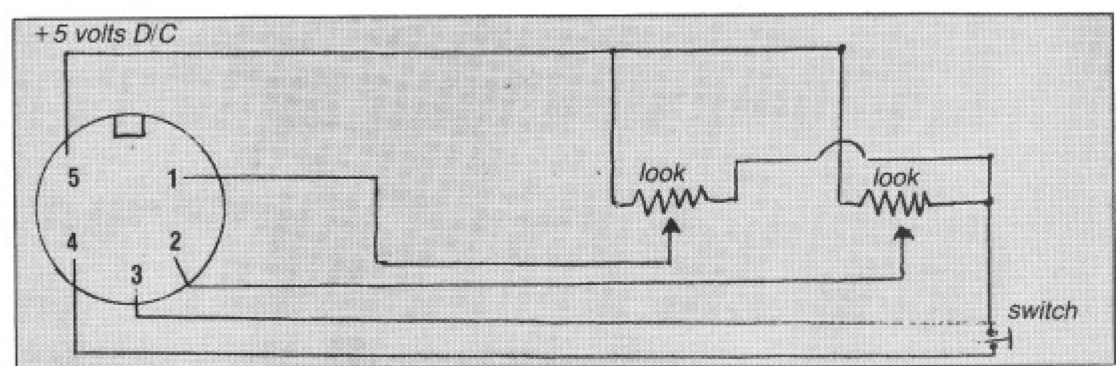


Figure 2: joystick circuit

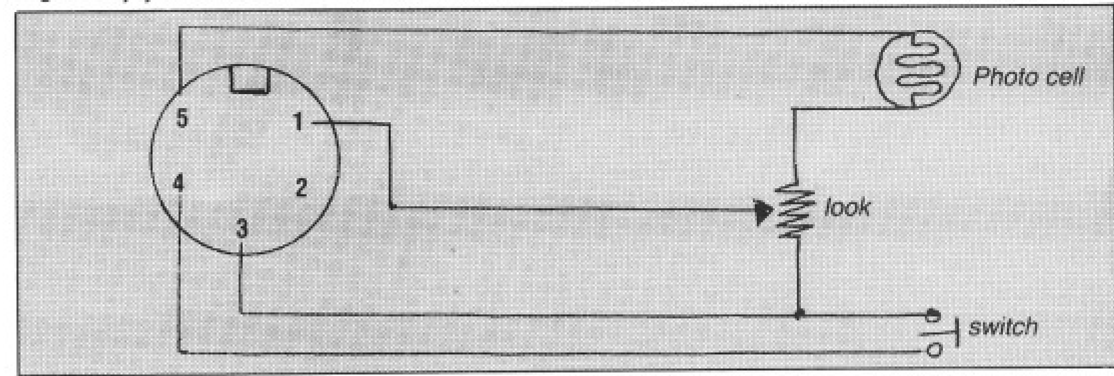


Figure 3: lightpen circuit

COLOUR	READING	DIFFERENCE
0	26	7.2
4	33.21	5.07
3	38.28	2.1
8	40.39	2.57
6	42.97	.4
1	43.38	4.4
7	47.78	2.37
2	50.16	1
5	51.16	−51.16

Table 1: lightpen readings

OPEN FILE FOR DRAGON USERS

Send us your Dragon programs, beginning with a general description and then explaining how the program is constructed. Take care that the listings are all bug-free, enclosing a cassette and, if possible, a printout. We pay £6 for each bug-free program published, double for the program of the month. If you have any problems with the listings, please send your queries to the appropriate author, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Mash

From Ian Balshaw and Julian Chapman in Northamptonshire

THE PROGRAM Mash is about saving your patient by safely landing your damaged helicopter on the landing pads.

There are enemy planes attacking the helicopter, but only some can destroy you. You have a limited fuel supply and when you run out of fuel you lose control. The program has a tune which is the theme tune of *Mash*. The program uses PMODE 4 Graphic Mode to create smooth hi-res graphics.

Program notes

10-70	Draws picture of mountains while Mash plays.
80-350	Plays Mash.
360-410	Asks you if you want tune.
440-600	Sets Graphic Mode. Gets and puts graphics on screen.
610-650	Sets up fuel.
660-740	Puts planes on screen. Sets up pad graphics.
750-1630	Check for keys to be pressed. Deletes one fuel point. Checks if you hit anything.
1640-1670	Plays crash noise.
1680-1710	Tells you if you crashed.
2000-2100	Tells you to press any key to start.
2700-2800	Returns to mainstream.

```
0 GOTO360
10 PMODE3,1:SCREEN1,0:PCLS
12 DRAW"BM0,192U5BM192,0R255"
15 DRAW"BM0,140E10R10E20U10F30F10E10R10E10R10F10R30F10R30F10D10F10R20F1
5D82"
30 CIRCLE(160,30),15
40 PAINT(160,30),2,4
50 PAINT(0,0),2,4
60_DRAW"BM24,70U20R6D10R4U10R6D20BR10U30R10D20U10L10L10R10D10BR10R10U10
L10U10R10BD10D10BR10U20D10R10U10D70"
70 PAINT(110,110),1,4
80 PLAY"T4O3V16"
110 PLAY"L4L1"
130 FORN=1TO2
140 PLAY"L4B-AB-A"
150 PLAY"B;-AL2GL4AGAG"
160 PLAY"AGL4.FL8AL4GFGFGFL4.EL86"
200 PLAY"L4FEFE"
210 PLAY"FGL2AL1A"
220 PLAY"L2AL4C"
230 PLAY"DCDCDL2CL4C"
260 PLAY"DCDC"
270 PLAY"DL2CL4CACDF"
280 PLAY"GFDC"
290 PLAY"L1DL2.L4C"
320 NEXTN
330 PLAY"L1DL2.L4C"
350 PLAY"ACDFL2DLDDL2.D":GOTO380
360 CLS:INPUT"TUNE <Y/N>";TU$:IFTU$="Y"THEN10 ELSE 380
380 REM****
400 REMMASH
410 REM****
420 GOSUB2000
440 PMODE4,1:SCREEN1,1:PCLS
450 Z$="BM0,170;E20R4E4F11E4F8R10E30F8E44F20D11R12E4E15R7E9R3E10E15R14D
4R6E8E20F5R4"
460 E$="BM1,0;F8G1L1H4G3F1E1R1D1U1R1U8BR3G4H1BD3R6U2E1BD3L2G2L2"
```

Continued on page 41

```
470 DRAWE$:DIME(9,9)
480 GET(0,0)-(10,10),E,G:DRAWZ$
490 J$="BM4,1;U2R2D2L2"
500 PAINT(0,192):COLOR0,5
510 DRAW"BM0,170;D22R255U37"
520 COLOR5,0
530 X$="BM4,1D1L1G2D1F2R2E2U1H2BD6R1D1BL8R2U1R1":DRAWX$
540 DIMI(9,9):FU=255
550 DIMV(9,9)
560 GET(0,0)-(10,10),I,G
570 PUT(0,0)-(10,10),V,PSET
580 DRAWJ$:GET(0,0)-(10,10),I,G
600 PUT(0,0)-(10,10),V,PSET
610 DRAW"BM1,1;D6U3R1BU3R1BR2D6R2U6BR2R2L2D3R1L1D3R2BR2R2L2U6"
650 DRAW"BM18,1;R236D6L236U6":LINE(20,3)-(FU,5),PSET,BF
660 FORC=0TO5
670 X=RND(245):Y=RND(110)+8
680 DRAW"BM"+STR$(X)+","+STR$(Y)+";BR2U6F4R10F2L15"
690 NEXTC:COLOR0,5
710 LINE(51,162)-(61,152),PSET
720 LINE(124,167)-(212,174),PSET
740 COLOR5,0
750 X=230:Y=9
760 S=5
770 W=1
780 FORN=0TO5
790 GOTO920
800 A$=INKEY$:IFA$<>""THEN GOSUB860
810 NEXTN
820 Y=Y+1
830 S=S-1
840 IFS<0THENS=0
850 GOTO780
860 IFFU=19THENRETURN
870 IFA$="A" THEN S=S+1:IFS=1THENS=2
880 IFS>10THENS=10
890 IFA$="S" THEN W=W=.1:IFW<0THEN W=0
900 LINE(FU,3)-(FU,5),PRESET:FU=FU-1
910 RETURN:IFA$<>"S" THEN W=W+.05
930 IFW>1THENW=1
940 X=X-W
950 IFX<1THENPUT(X,Y)-(X+10,Y+10),V,PSET
960 IFPPOINT(X,Y+10)=5ORPPOINT(X+8,Y+10)=5THEN990
970 PUR(X,Y)-(X+10,Y+10),PSET
980 GOTO800:X=INT(X):Y=INT(Y)
1600 IFY=152ORY=151ORY=156 ORY=163 THEN 1610ELSE1620
1610 IFX=50ORX=51 ORX=124ORX=125OR(X>197ANDX<203)THEN 1720ELSE1620
1620 R$="YOU CRASHED YOUR PATIENT AND CREW WERE KILLED"
1630 PUT(X,Y)-(X+10,Y+10),E,PSET
1640 PLAY"T255O1"
1650 FORV=3TO0STEP-1
1660 PLAY"V"+STR$(V)+"DACGEBFDA"
1670 NEXTV
1680 SCREEN0,0
1685 CLS
1700 ?R$
1710 GOTO1770
1720 PLAY"T50GAGAGAGAGAGAGAGAGAGAGAGAGAAGAGAGAGAGAGA":GOTO1750
1740 SCREEN0,0
1750 CLS
1760 ?"WELL DONE YOU SAVED YOUR PATIENT"
1770 ?"YOU HAD "FU-19"UNITS OF FUEL LEFT"
```

Continued on page 42

```
1780 FORN=1TO1000:NEXTN
1790 ?:?:INPUT"WOULD YOU LIKE ANOTHER GO";P$:IFP$="Y" THEN RUN ELSE CLS:
END
2000 CLS3:?"PRESS ANY KEY"
2100 IFINKEY$="" THEN 2100
2700 RETURN
2800 END
```

Motor Cross

From Fraser Chadburn in Kempston

MOTOR CROSS is a game for one player requiring the utmost in precision and timing. Using the keyboard the player must steer the car around the track without crashing into the sides. This you must do for as long as possiblle, remembering that the faster you go the higher your score, but also the more you skid.

When the car hits the side of the track one point is added to the damage score and when the damage total reaches eight the game is over. The program uses PEEKs to recognise the key being pressed and therefore if a key is kept down the car will keep turning until the key is released.

The track is set up in lines 480-540 and so can easily be changed or modified to give a different track. The program includes brief REM statements separating the main sections, all of which can be left out to save time.

Program notes

100-460	Defines 16 positions of car and checks for instructions.
480-540	Draws and displays track.
550-560	Plays national anthem and resets variables.
580	Goes to appropriate subroutine (see lines 690-880).
590-640	Increases or decreases score depending on current speed and checks to make sure speed stays within current limits.
660-670	Checks to see if car has turned full 360 degrees, and if so it resets MTO 1.
690-880	16 subroutines to put relative car position on screen and check for crash.
900	Damage routine.
920-930	Crash routine.
950-1040	Score routine.
1060-1120	Keyboard subroutine.
1140-1160	Instructions.

Variables

Arrays	M1-M8 and R1-R8, 16 positions of car.
T$	Tree.
X,Y	Co-ordinates of car.
M	Rotational positions of car.
SC	Current score.
SX	Current maximum speed of car.
DM	Damage of car.
HI	Highest score so far.
A	Horizontal acceleration of car.
B	Vertical acceleration of car (used in skidding).

```
0 '****************************
20 '** MOTOR CROSS (C) 1983 ***
30 '***** BY F.J.CHADBURN *****
40 '****************************
50 POKE &HFFD7,0:CLEAR500
60 CLS:PRINT@38,"MOTOR CROSS (C)";:PRINT@76,"BY F.J.CHADBURN";:PRINT@457,"PLEASE
 WAIT"
70 DIMM1(12),M2(13),M3(10),M4(12),M5(10),M6(10),M7(10),M8(13)
80 DIMR1(13),R2(13),R3(13),R4(13),R5(13),R6(13),R7(13),R8(13)
90 '**** PREPARE GRAPHICS *****
100 PMODE 4:PCLS
110 LINE(5,6)-(8,6),PSET:PSET(5,4,5):PSET(7,4,5):PSET(5,8,5):PSET(7,8,5)
120 GET(0,1)-(12,12),M1,G:PCLS
130 LINE(5,6)-(8,8),PSET:PSET(6,4,5):PSET(8,5,5):PSET(4,8,5):PSET(6,9,5)
140 GET(0,0)-(11,12),R1,G:PCLS
150 LINE(8,6)-(10,8),PSET:PSET(9,4,5):PSET(11,6,5):PSET(6,7,5):PSET(8,9,5)
160 GET(0,0)-(13,13),M2,G:PCLS
170 LINE(6,5)-(8,8),PSET:PSET(8,4,5):PSET(9,6,5):PSET(4,6,5):PSET(5,8,5)
180 GET(0,0)-(12,11),R2,G:PCLS
190 LINE(6,4)-(6,7),PSET:PSET(4,4,5):PSET(4,6,5):PSET(8,4,5):PSET(8,6,5)
200 GET(1,0)-(12,11),M3,G:PCLS
210 LINE(6,5)-(4,8),PSET:PSET(4,4,5):PSET(3,6,5):PSET(8,6,5):PSET(7,8,5)
220 GET(0,0)-(12,11),R3,G:PCLS
230 LINE(5,6)-(3,8),PSET:PSET(4,4,5):PSET(2,6,5):PSET(7,7,5):PSET(5,9,5)
240 GET(0,0)-(12,12),M4,G:PCLS
250 LINE(3,8)-(6,6),PSET:PSET(5,4,5):PSET(3,5,5):PSET(7,8,5):PSET(5,9,5)
260 GET(0,0)-(11,12),R4,G:PCLS
270 LINE(4,6)-(7,6),PSET:PSET(5,4,5):PSET(7,4,5):PSET(5,8,5):PSET(7,8,5)
280 GET(2,1)-(14,13),M5,G:PCLS
290 LINE(3,4)-(6,6),PSET:PSET(5,3,5):PSET(7,4,5):PSET(3,7,5):PSET(5,8,5)
300 GET(0,0)-(11,12),R5,G:PCLS
310 LINE(3,3)-(5,5),PSET:PSET(5,2,5):PSET(2,5,5):PSET(7,4,5):PSET(4,7,5)
320 GET(0,0)-(11,11),M6,G:PCLS
330 LINE(4,3)-(6,6),PSET:PSET(7,3,5):PSET(8,5,5):PSET(3,5,5):PSET(4,7,5)
340 GET(0,0)-(12,11),R6,G:PCLS
350 LINE(6,4)-(6,7),PSET:PSET(4,5,5):PSET(4,7,5):PSET(8,5,5):PSET(8,7,5)
360 GET(1,1)-(13,13),M7,G:PCLS
370 LINE(6,6)-(8,3),PSET:PSET(9,5,5):PSET(8,7,5):PSET(5,3,5):PSET(4,5,5)
```

Continued on page 45

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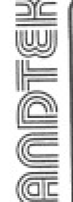
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```
380 GET(0,0)-(12,11),R7,G:PCLS
390 LINE(7,5)-(9,3),PSET:PSET(7,2,5):PSET(5,4,5):PSET(10,5,5):PSET(8,7,5)
400 GET(0,0)-(12,13),M8,G:PCLS
410 LINE(5,6)-(8,4),PSET:PSET(6,3,5):PSET(4,4,5):PSET(8,7,5):PSET(6,8,5)
420 GET(0,0)-(12,13),R8,G
430 '***** INSTRUCTIONS ? *****
440 PRINT@453,"NEED INSTRUCTIONS(Y/N)";:INPUT IN$:IF IN$="Y" OR IN$="N" THEN 450
 ELSE 440
450 IF IN$="Y" THEN GOSUB 1140
460 CLS:PRINT@234,"PLEASE WAIT"
470 '***** PREPARE SCREEN *****
480 COLOR 0,1:PCLS
490 DRAW"BM30,50;D80F30R140E20U20H20L40H30U20H30L40G30;BM60,60;D60F14R110U3L33H4
6U20H14L24G7D1":PAINT(40,60),0,0
500 T$="UHUHFE2RE2HUEH2GH2F2GFG2EFHEHE3HLH2GHGHG2LGFG2FDHF2REHEHUE3GHFG2DFGFGF2E
FEGHGFD2GD"
510 DRAW"BM75,110;XT$;BM115,125;XT$;BM185,75;XT$;BM25,165;XT$;BM15,35;XT$;BM85,7
5;XT$;BM230,175;XT$;BM110,182;XT$;"
520 LINE(1,1)-(256,192),PSET,B
530 PUT(190,140)-(202,152),M5,PSET
540 SCREEN1,0
550 PLAY"V25T701GGAL3FL8GL4A01BB02C01L3BL8AL4GAGL4FL2GL402DDDL3DL8C01L4B02CCCL3C
01L8BL4AB02L8C01BAGL3B02L8CL4D02L8E02CL401BAL2G"
560 X=190:Y=140:M=9:A=0:B=0:TIMER=0:SC=0:SX=2:DM=0
570 '***** START OF GAME ******
580 ON M GOSUB 690,710,720,730,740,760,770,780,790,810,820,830,840,860,870,880
590 IF SX=1 THEN SC=SC-5
600 IF SX=3 THEN SC=SC+5
610 IF A<-SX THEN A=-SX
620 IF A>SX THEN A=SX
630 IF B<-SX THEN B=-SX
640 IF B>SX THEN B=SX
650 IF PEEK(337)<>255 THEN GOSUB 1060
660 IF M>16 THEN M=1
670 IF M<1 THEN M=16
680 GOTO 580
690 IF B>0 THEN B=B-0.15 ELSE B=B+0.15
700 A=A+0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+11),M1,PSET:IFPPOINT(X+13,Y)=1 OR PPOIN
T(X+13,Y+12)=1 THEN900ELSERETURN
710 A=A+0.3:B=B+0.15:X=X+A:Y=Y+B:PUT(X,Y)-(X+11,Y+12),R1,PSET:IFPPOINT(X+12,Y+13
)=1 OR PPOINT(X+2,Y+13)=1 OR PPOINT(X+12,Y+2)=1 THEN900ELSERETURN
720 A=A+0.3:B=B+0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+13,Y+13),M2,PSET:IFPPOINT(X+14,Y+1)=
1OR PPOINT(X+1,Y+14)=1 THEN GOTO 900 ELSE RETURN
730 A=A+0.15:B=B+0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+11),R2,PSET:IF PPOINT(X+13,Y+1
2)=1 OR PPOINT(X+13,Y+1)=1 OR PPOINT(X+2,Y+12)=1 THEN 900 ELSE RETURN
740 IF A>0 THEN A=A-0.15 ELSE A=A+0.15
750 B=B+0.3:Y=Y+B:X=X+A:PUT(X,Y)-(X+11,Y+11),M3,PSET:IF PPOINT(X,Y+12)=1OR PPOIN
T(X+10,Y+12)=1 THEN 900 ELSE RETURN
760 A=A-0.15:B=B+0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+11),R3,PSET:IF PPOINT(X-1,Y+11
)=1 OR PPOINT(X-1,Y+2)=1 OR PPOINT(X+11,Y+12)=1 THEN 900 ELSE RETURN
770 A=A-0.3:B=B+0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+12),M4,PSET:IF  PPOINT(X-1,Y+1)
=1 OR PPOINT(X+12,Y+13)=1 THEN 900ELSERETURN
780 A=A-0.3:B=B+0.15:X=X+A:Y=Y+B:PUT(X,Y)-(X+11,Y+12),R4,PSET:IF PPOINT(X-1,Y+13
)=1 OR PPOINT(X-1,Y+2)=1 OR PPOINT(X+10,Y+13)=1 THEN 900 ELSE RETURN
790 IF B>0 THEN B=B-0.15 ELSE B=B+0.15
800 A=A-0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+12),M5,PSET:IF PPOINT(X-1,Y)=1 OR PPOIN
T(X-1,Y+9)=1 THEN 900 ELSE RETURN
810 A=A-0.3:B=B-0.15:X=X+A:Y=Y+B:PUT(X,Y)-(X+11,Y+12),R5,PSET:IF PPOINT(X-1,Y-1)
=1 OR PPOINT(X+9,Y-1)=1 OR PPOINT(X-1,Y+10)=1 THEN 900 ELSE RETURN
820 A=A-0.3:B=B-0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+11,Y+11),M6,PSET:IF PPOINT(X-1,Y+9)=
1 OR PPOINT(X+9,Y-1)=1 THEN 900 ELSE RETURN
830 A=A-0.15:B=B-0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+11),R6,PSET:IF PPOINT(X+1,Y-1)
=1 OR PPOINT(X+10,Y-1)=1 OR PPOINT(X-1,Y+9)=1 THEN 900 ELSE RETURN
840 IF A>0 THEN A=A-0.15 ELSE A=A+0.15
850 B=B-0.3:Y=Y+B:X=X+A:PUT(X,Y)-(X+12,Y+12),M7,PSET:IF PPOINT(X,Y-1)=1 OR PPOIN
T(X+12,Y-1)=1 THEN 900 ELSE RETURN
860 A=A+0.15:B=B-0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+11),R7,PSET:IF PPOINT(X+12,Y-1
)=1 OR PPOINT(X+1,Y-1)=1 OR PPOINT(X+13,Y+10)=1 THEN 900 ELSE RETURN
870 A=A+0.3:B=B-0.3:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+13),M8,PSET:IF PPOINT(X+1,Y-1)=
1 OR PPOINT(X+13,Y+12)=1 THEN 900 ELSE RETURN
```

Continued on page 46

```
880 A=A+0.3:B=B-0.15:X=X+A:Y=Y+B:PUT(X,Y)-(X+12,Y+13),R8,PSET:IF PPOINT(X+12,Y-1
)=1 OR PPOINT(X+13,Y+10)=1 OR PPOINT(X+1,Y-1)=1 THEN 900 ELSE RETURN
890 '***** DAMAGE ROUTINE *****
900 DM=DM+1:IF DM<>8 THEN PLAY"T25501A":GOTO 610
910 '***** CRASH ROUTINE ******
920 DRAW"BM170,27;U12R6BD12L6BR9U12R6D6L6F6BR3U12R6D6L6R6D6BR3R6U6L6U6R6BR3D12U6
R6U6D12"
930 FOR N=1TO50:SCREEN1,1:PLAY"T25501A":SCREEN1,0:PLAY"T25501DEF":NEXTN
940 '***** SCORE ROUTINE ******
950 CLS:SC=SC+TIMER
960 IF SC<HI THEN SC$="BAD LUCK !!!" ELSE SC$="WELL DONE !!!"
970 FOR N=0TO128 STEP 33:PRINT@70+N,SC$;:NEXTN
980 PRINT@260,"YOU SCORED ";SC;"POINTS";
990 IF SC<HI THEN GOTO 1010 ELSE HI=SC
1000 PRINT@322,"CONGRATULATIONS! YOU HAVE           BROKEN THE HIGH SCORE";:GO
TO 1020
1010 PRINT@324,"THE HIGH SCORE IS ";HI
1020 PRINT@457,"ANOTHER GAME Y/N?"
1030 IF PEEK(339)=223 THEN PRINT@457,"PLEASE WAIT":GOTO 480
1040 IF PEEK(344)=247 THEN POKE &HFFD6,0:END:ELSE 1030
1050 '** KEYBOARD SUBROUTINE **
1060 IF PEEK(344)=223 THEN M=M+1:RETURN
1070 IF PEEK(343)=223 THEN M=M-1:RETURN
1080 IF PEEK(342)=223 THEN SX=SX-1
1090 IF PEEK(341)=223 THEN SX=SX+1
1100 IF SX<1 THEN SX=1
1110 IF SX>3 THEN SX=3
1120 RETURN
1130 '***** INSTRUCTIONS ******
1140 PRINT@129,"yOU CONTROL A SMALL CAR AND       MUST TRY TO KEEP IT ON THE
 TRACK FOR AS LONG AS POSSIBLE  yOUR SCORE WILL BE DISPAYED AT   THE END OF EACH
 GAME TOGETHER   WITH THAT OF THE HIGH SCORE.   tO CONTROL YOUR CAR USE"
1150 PRINT"  THE RIGHT AND LEFT KEYS TO       TURN AND THE UP AND DOWN KEYS   TO
ACCELERATE AND BRAKE        rEMEMBER THE FASTER YOU GO THE   HIGHER YOUR SCORE .
PRESS ANY    KEY TO BEGIN.";
1160 IF INKEY$<>"" THEN RETURN ELSE 1160
```

Composer

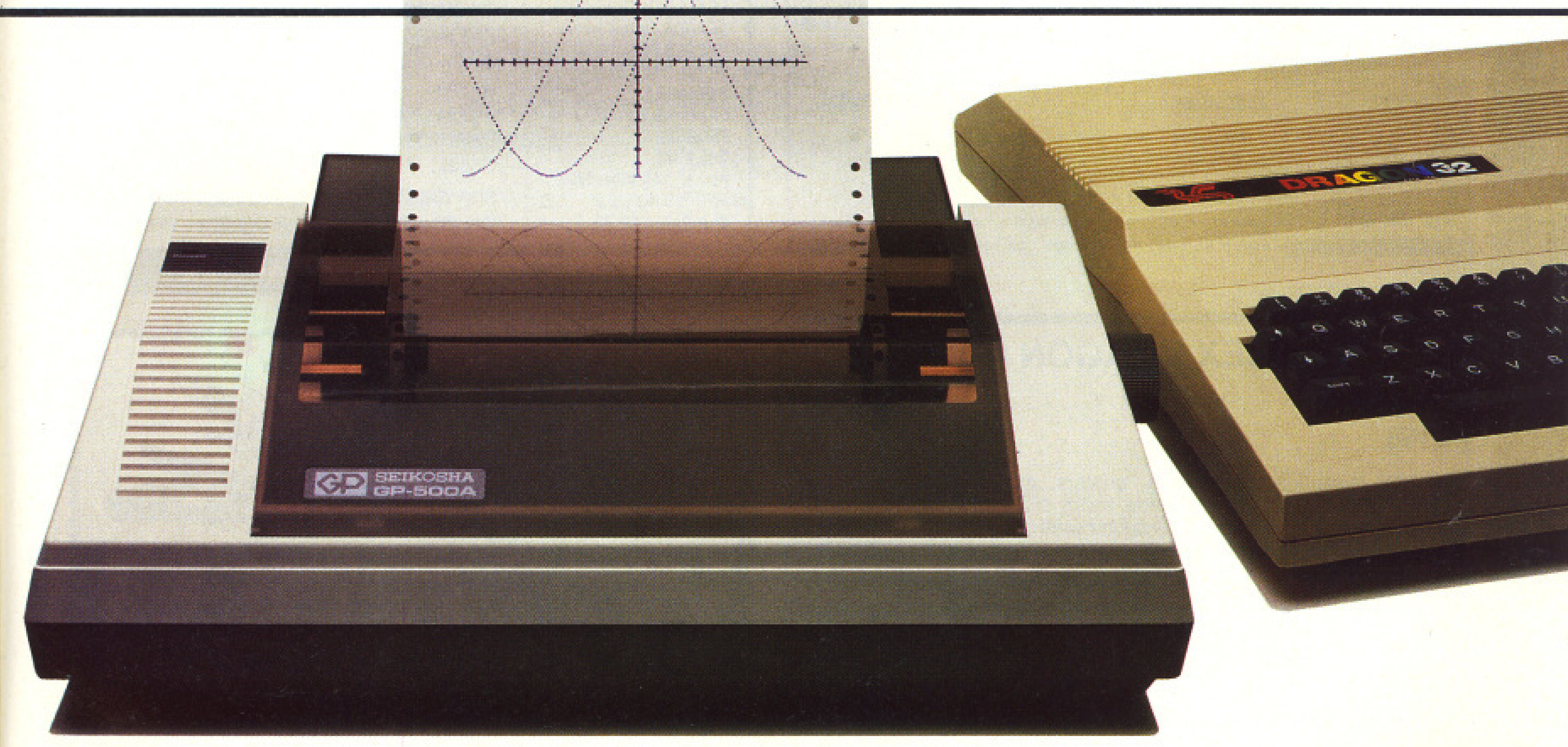
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```
10 '**************
20 '***COMPOSER***
30 '******BY******
40 '**B & M BOND**
50 '**************
60 PMODE4,1:SCREEN1,1:PCLS5
70 DRAW"CØ;BM17,32;R22ØD1ØØL22ØU1ØØ"
80 DRAW"CØ;BM39,132;U5ØL5U5ØD5ØR1ØU5ØD5ØL5D5ØR22U5ØL5U5ØD5ØR1ØU5
ØD5ØL5D5ØR22U1ØØD1ØØR22U5ØL5U5ØD5ØR1ØU5ØD5ØL5D5ØR22U5ØL5U5ØD5ØR1
ØU5ØD5ØL5D5ØR22U5ØL5U5ØD5ØR1ØU5ØD5ØL5D5ØR22U1ØØD1ØØR22U5ØL5U5ØD5
ØR1ØU5ØD5ØL5D5ØR22U5ØL5U5ØD5ØR1ØU5ØD5ØL5D5Ø"
90 DRAW"CØ;BM39,164;D28R177U28L177"
100 PAINT(128,162),Ø,Ø
110 PAINT(40,6Ø),Ø,Ø:PAINT(62,6Ø),Ø,Ø:PAINT(106,6Ø),Ø,Ø:PAINT(12
8,6Ø),Ø,Ø:PAINT(15Ø,6Ø),Ø,Ø:PAINT(194,6Ø),Ø,Ø:PAINT(216,6Ø),Ø,Ø
120 DRAW"S8"
130 DRAW"CØ;BM26,124;HU4ER2FHL2GD4FR2E"
140 DRAW"CØ;BM46,124;U6R3FD4GL3"
150 DRAW"CØ;BM68,124;R4L4U3R4L4U3R4"
160 DRAW"CØ;BM9Ø,124;U3R4L4U3R4"
170 DRAW"CØ;BM114,124;R2EULRDGL2HU4ER2F"
180 DRAW"CØ;BM134,124;U5ER2FD5U3L3"
190 DRAW"CØ;BM156,124;U6R3FDGFDGL3U3R3"
200 DRAW"CØ;BM18Ø,124;HU4ER2FHL2GD4FR2E"
210 DRAW"CØ;BM2ØØ,124;U6R3FD4GL3"
220 DRAW"CØ;BM222,124;R4L4U3R4L4U3R4"
230 DRAW"CØ;BM48,184;HU4ER2FHL2GD4FR2E"
```

Continued on page 49

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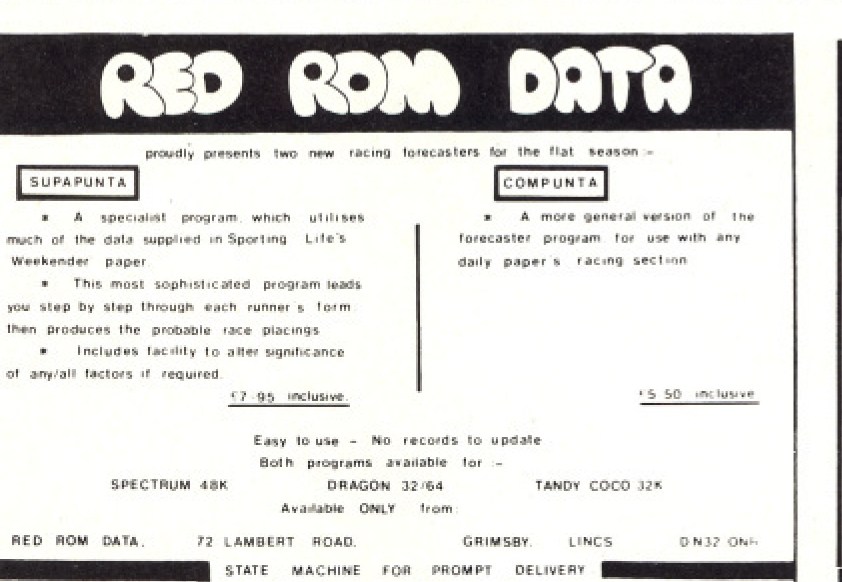
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```
240 DRAW"C0;BM70,184;R2EU4HL2GD4F"
250 DRAW"C0;BM90,184;U6F2E2D6"
260 DRAW"C0;BM112,184;U6R3FDGL3"
270 DRAW"C0;BM134,184;R2EU4HL2GD4F"
280 DRAW"C0;BM154,182;FR2EH4ER2F"
290 DRAW"C0;BM178,184;R4L4U3R4L4U3R4"
300 DRAW"C0;BM200,184;U6R3FDGL3RF3"
310 P$="O3L3C;L3EAGL6FEDC;O4L3CO3BAL1G;O4L3CO3BAGL6FEDCL3FEDC;L6
DEFGO3L3C;L3EAGL6FEDC;O4L3CO3BAL1G;O4L3CO3BAGL6FEDCL3FED;L1C"
320 PLAY"T4"+P$
330 GOSUB590
340 CLS5
350 PLAY"L5"
360 A$=INKEY$
370 IF A$="1" THEN PLAY"O1":PRINT"O1;";
380 IF A$="2" THEN PLAY"O2":PRINT"O2;";
390 IF A$="3" THEN PLAY"O3":PRINT"O3;";
400 IF A$="4" THEN PLAY"O4":PRINT"O4;";
410 IF A$="5" THEN PLAY"O5":PRINT"O5;";
420 IF A$="C" THEN PLAY"C":PRINT;A$;
430 IF A$="D" THEN PLAY"D":PRINT;A$;
440 IF A$="E" THEN PLAY"E":PRINT;A$;
450 IF A$="F" THEN PLAY"F":PRINT;A$;
460 IF A$="G" THEN PLAY"G":PRINT;A$;
470 IF A$="A" THEN PLAY"A":PRINT;A$;
480 IF A$="B" THEN PLAY"B":PRINT;A$;
490 IF A$="I"THEN GOTO520
500 IF A$="H" THEN680
510 GOTO360
520 LINE INPUT" input tune ";N$
530 B$=INKEY$:IFB$=""THEN530 ELSEB=ASC(B$)
540 IFB=80 THEN580
550 IFB=73 THEN520
560 IFB=77 THEN350
570 IF B=72 THEN680
580 PLAY N$:GOTO530
590 'INSTRUCTIONS          600 CLS
610 PRINT@11,"COMPOSER"
620 FOR I=43 TO 50:PRINT@I,CHR$(131):NEXT
630 PRINT"YOU HAVE JUST HEARD A RENDITION OF THE WELL KNOWN TUNE
,LAVENDER BLUE.THIS IS AN EXAMPLE OF THE  DRAGONS MUSICAL CAPABI
LITIES.CANYOU WRITE ONE BETTER?"
640 PRINT"THIS PROGRAM WILL ALLOW YOU TO  COMPOSE YOUR OWN TUNE,
REPLAY ON REQUEST AND MODIFY IF NECESSARY."
650 PRINT:PRINT"FOR A FULL LIST OF KEY FUNCTIONS      (PRESS THE
 SPACEBAR)"
660 A$=INKEY$:IF A$="" THEN 660
670 IF A$=" "THEN 680
680 CLS
690 PRINT"THE FOLLOWING KEYS USED ARE:-"
700 PRINT:PRINT"'M'--(MANUAL)THIS ALLOWS YOU TO       PLAY THE NO
TES (A-G) FROM        THE KEYBOARD AND CHANGE THE      OCTAVES (KE
YS 1-5)"
710 PRINT"'I'--(INPUT)WHEN YOU ARE SURE OF      THE TUNE YOU HAVE
 PRACTISED      IN MANUAL MODE,PRESS THIS       LETTER AND COPY Y
OUR NOTES,      ENSURING THAT YOU INSERT        THE NECESSARY PLA
Y COMMANDS      SUCH AS SHARPS,FLATS,NOTE       LENGTH ETC."
720 PRINT:PRINT"  PRESS (SPACEBAR) TO CONTINUE";
730 A$=INKEY$:IF A$="" THEN 730
740 IF A$=" " THEN 750
750 CLS:PRINT:PRINT"'P'--(PLAY)AFTER TYPING IN YOUR       NOTES A
ND ENTERING IN THE        'I' MODE,YOU CAN PLAY YOUR       TUNE AN
Y NUMBER OF TIMES.        BY PRESSING THIS KEY."
760 PRINT:PRINT"'H'--(HELP)THIS WILL ENABLE YOU       TO RETURN T
O THE KEY LIST        IN ORDER TO REFRESH YOUR        MEMORY."
770 PRINT:PRINT"  PRESS (SPACEBAR) TO CONTINUE";
780 A$=INKEY$:IFA$=""THEN 780
790 IFA$=" "THEN 340 ELSE RETURN
```

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FLEX is the registered trade mark of Technical Systems Incorporated. £86.25 inc. VAT and P&P.



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If you've got a technical question or problem write to Brian Cadge, Dragon Answers, *Dragon User*, 12/13 Little Newport Street, London WC2R 3LD.

Dragon Answers

Memory address

I WOULD like to know the port memory address for use with a joystick and light pen on a Dragon 32K.

David Morgan, Ferndale, Rhondda.

THE joystick/light pen sockets are wired to the Dragon's D/A convertor which is addressed as location $FF20. However, to read values from this address involves a lot of tedious playing around selecting which socket you want to address, and thankfully there is a ROM routine to do it for us.

The values from the four inputs are stored as a number between 0-63 in locations 346 to 349. The values can be updated at any time by using the machine language command JSR 48466, or in Basic using EXEC 48466.

As the same D/A converter is used for sound output, you cannot mix sound or have the sound channel open when reading the ports.

Basic converter

I WOULD like to know whether there is a computer for the Dragon 32, which could convert Basic language straight into machine code.

D. K. Dashfield, Frimley, Surrey.

THERE IS such a compiler available for the Dragon 32 from Oasis Software. The compiler will handle sound and graphics as well as FOR-NEXT loops, arrays, strings, etc. It can also compile programs straight from tape.

The compiler costs £14.95 and is available from Oasis Software, 9a Alexandra Parade, Weston-super-Mare, and the telephone number is (0934) 419921.

Out of the maze

ON THE text screen I have constructed the plan view of a maze in string arrays consisting of ASCII CHR: 128, and move a CHR: around using the arrow keys.



The problem is, how do I detect when the moving CHR: is accidentally moved out of the maze?

If the CHR: is moved out I also want to print a message when this happens.

R Collinson, Spondon, Derby.

THE easiest way to do this is to PEEK the screen memory. If the character you are moving around is stored as CHAR, and the current position on the screen is x,y, then a simple program line such as:

```
100 IF PEEK (1024+X+32*Y)<>128 AND PEEK(1024+X+32*Y)<>CHAR THEN . . . out of maze routine
```

will detect whether the player has attempted to leave the maze.

Defender games

I HAVE owned a Dragon 32 computer for some time now. In my searches of magazines and software dealers, I have, as yet, been unable to find a Defender game for my computer.

Do you know of any such game, and if so, where can I obtain a copy, and for how much?

Stephen Le Hunte, Camborne, Cornwall.

THERE ARE a number of Defender type games on the market for the Dragon. One of the most accurate imitations I have seen is called Planet Invasion by Microdeal.

This costs £8 and should be available at stores such as Boots or direct from Microdeal at 41 Truro Road, St Austell, Cornwall PL25 5JE. The game requires a joystick to play and has colour or black and white options.

Code accessing

COULD you please tell me if it is possible to access any of the machine code routines in Rom for hi-res graphics directly from a machine code program? If so how?

A Jordan, King's Heath, Birmingham.

LISTED below are the machine code entry addresses for all of the useful graphics commands. Before using any of them you must set up location 166/167 to point to the correct ASCII characters, possibly held in a table within your m/c program.

For example, if you wanted to use PRESET, you would set up loc 166 to point to "(x,y)" where x and y are the graphics coordinates you wish to use, and then use JSR 42739.

LINE = 42825
PSET = 42735
SCREEN = 43518
CIRCLE = 45624
PMODE = 43439
PCLS = 43200
PRESET = 42739
COLOR = 43220
PAINT = 44167
DRAW = 45137

POKE speeds

IT'S PROBABLY already been answered but . . . Why doesn't the widely publicised POKE &HFFD6,0 and its alter ego, POKE &HFFD7,0 work on my Dragon © May 1983?

If I try this method of speeding up my programs, they instantly crash. Presumably something has been changed, so is there an alternative location for newer Dragons? I remain stuck on 0.9 megahertz.

Mike Ashburn, Ashton Keynes, Swindon.

YOU'RE QUITE right, this question has already been answered, but it keeps turning up time and time again and so is worth repetition. The command POKE &HFFD7 (and 65495) instructs the SAM chip to address ROM at double speed (1.8 MHz), hence the Basic runs faster — note that user machine code doesn't run faster as this is in RAM. The 6809 processor at the heart of the Dragon is only supplied to run at normal speed. Some will, however, tolerate the double speed — these Dragons are the exception, not the norm and there is nothing wrong with your Dragon.

Unfortunately, there is nothing you can do short of replacing the 6809 chip and maybe others with ones of a higher specification (which I don't recommend). In any case, Dragon Data does not recommend the use of the high speed POKE.

Assembly language

I HAVE bought a copy of *Programming the 6809* by Rodnay Zaks and William Labiak, to learn assembly language on my Dragon. Which assembler for sale under £10 do you think would be best to use with my book, and how can I purchase it?

Paul Burgin, Fulwood, Sheffield.

DRAGON DATA offers a very good assembler/editor for £10.95 called Dream (can no L3 0515). This comes on cassette and so uses some RAM itself.

If you prefer a cartridge version this is available, called All Dream which also includes a disassembler. This costs £24.95 (cat no 12 0001) and although it is more expensive, it is probably a better investment. Both should be available from most Dragon software dealers including Boots.

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DRAGONCOPY will copy machine code programs. For instructions send 50p and SAE to Dragoncopy, 11 Bentley Road, Doncaster, Yorkshire.

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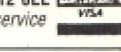
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ADVERT INDEX

Competition Corner

Answers to Competition Corner, *Dragon User*, 12/13 Little Newport Street, London WC2R 3LD

WITH ALL FOOLS DAY nearly on us again, it is perhaps appropriate to look at some of the ways in which mathematicians have attempted to fool each other over the years. In each case, although the problem may appear very complicated, there is, in fact, a simple method of finding the answer.

1. Bill and Ben start out simultaneously from opposite ends of a straight 10-mile-long road, walking towards each other, Bill walking at two miles an hour and Ben walking at three miles an hour. At the same time as the men set off, Bill's dog runs on ahead until he meets Ben. He then turns and runs back to Bill. This procedure is repeated, with the dog zig-zagging backwards and forwards between the two men until they finally meet. If the dog runs at ten miles an hour — and no time is lost in changing direction — how far does he run in all?
2. At 12 noon the hands of a clock lie one above the other. When will they next be precisely superimposed?
3. The secretary of the Muddlecombe Chess Club was trying to arrange the fixture list for the annual knockout championships. There were 97 entrants, who were to be paired, the winner of each game going forward to the next round, until only one player remains as champion. The secretary knew that there would have to be a number of byes, but how many matches,

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Answer **Gordon Lee** *to win DRG Business Systems' prize*

in all, would need to be played?
4. I have a three-inch cube of wood. By making six cuts with a saw I can cut the block into 27 smaller one-inch cubes. However, is it possible to complete this task with a fewer number of cuts if I am allowed to rearrange the pieces before each cut? Now for the answers:
1. I hope that you didn't work this out by a series of decreasing distances! Bill and Ben are approaching each other at a *combined* speed of 5 mph. Therefore they will meet in two hours. As the dog runs at 10 mph, it will run a total distance of 20 miles in the time.
2. In the 12 hours from noon to midnight, the hands are one above the other *11* times. As both hands move at constant speeds, they coincide every $1^{2}/_{11}$ hours. Thus, after noon, they will next coincide at 1.05 and $27^{3}/_{11}$ seconds.
3. The east way to answer this problem is to realise that every game will eliminate *one* player, therefore if there are 97 competitors, all but one of the players will need to be eliminated, and to do this 96 games will need to be played.
4. It is impossible to reduce the number of cuts by rearranging the pieces. Cutting a block in the manner described will produce 27 smaller cubes, of which one will be located in the very centre of the larger cube. This one cube will have all six of its faces newly cut — therefore needing the minimum of six cuts.

This month's competition question is also concerned with cutting cubes of wood. I have a number of large cubes of wood, each a different size but each an exact number of inches along the side. I wish to make a quantity of toy bricks for the school bazaar by cutting every large block into one-inch cubes.

Unfortunately, the larger blocks have been painted on all surfaces. So I find that, after I have completed sawing, I have some blocks with at least one face painted, the rest having all six faces newly sawn. In fact, there are equal numbers of painted and unpainted cubes. **What is the smallest number of small cubes that I could possibly have, and state also the number and sizes of the original large cubes?**

Prize

A PRINTER will not only enhance your programming skills but also add to the range of things you can do with your Dragon — and this month DRG Business Systems gives you the chance to win one of the latest Seikosha models.

The printer in question is the Seikosha GP500A, worth nearly £250. This model prints at 50 characters a second in an 80-column dot matrix format on paper up to 10 inches wide. Features include intermixing of graphic, character and double width character modes on a single line, printing a copy as well as the original, and a single command enabling a column of graphic data to be repeated as many times as you need.

Rules

TO WIN the Seikosha printer you have to send in the most elegant solution to the puzzle. You must show both the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon. As a tiebreaker, complete the following sentence in 15 words or less: "I want to add a printer to my Dragon because . . ."

Your entry must arrive at *Dragon User* by the last working day in April. The name of the winner, and the solution to the puzzle, will be published in our July issue. You may only enter the competition once. Entries will not be acknowledged and we cannot enter into correspondence discussing the result.

January winner

FIRST OF ALL you had to find all five-digit squares in which the third and fourth digits are alike, all other digits being different. This is to correspond to the word "HAPPY". This can be done easily with a program that checks the squares of these numbers from 100 to 316. By putting the square into a string the duplication can be tested for. This results in just 16 possible values. Now, there are just 13 three-digit squares with all digits different, so each possible five-digit square should be matched against the three-digit squares.

Only those pairs that do not contain a common digit are possible because there are no *letters* common to both HAPPY and NEW. For example, the lowest number which could stand for HAPPY is 12996, so only those three-digit squares which do not contain a 1, 2, 6 or 9 can be considered. Thus, only the square 784 would be a possibility.

Some of the five-digit squares can be totally eliminated. For instance, 24336 is not possible as there is no three-digit square that does not contain at least one of these digits. Some squares, such as 63001, have more than one possible pair. This number can be paired with 289, 529, 729 or 784.

All possible pairs should be listed for values of "HAPPY" and "NEW". We now have to find a value for the word "YEAR" that is to be prime. But, you will notice that the three digits represented by the letters Y, E and A are already determined as they all appear in the other two words. So, taking as an example the pair HAPPY=12996 and NEW=784, the prime represented by YEAR must begin with the digits 682. The final digit can only be a digit which doesn't already appear in this set. A simple program can be devised to test for primes, and from this it can be found that only 6823 is prime.

If this procedure is continued down the list all possibilities except for seven can be eliminated. However, we are told that the professor included the value of this last digit R, in order that the problem could be solved. If we look at the list of seven possibilities, there are four instances where this last digit is a 3, two instances where it is a 7, and one instance where it is a 9. Therefore, only if it was this last case that the professor gave as the value for R would a unique solution be possible. Therefore the solution is HAPPY=13225 (115^2), NEW=784 (28^2), YEAR=5839.

James MacDonald of Luton was one of the many to find the correct answer. His winning tiebreaker suggested that Orbis was the right name for a small business computer (we'll let you know if Dragon Data takes him up on this). James will be receiving the prize donated by Dragon Data itself — a total of 70 software packages.

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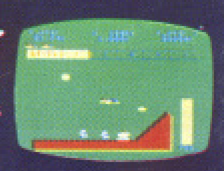
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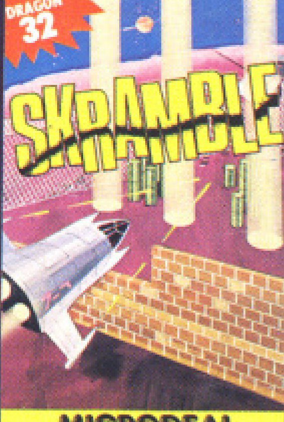




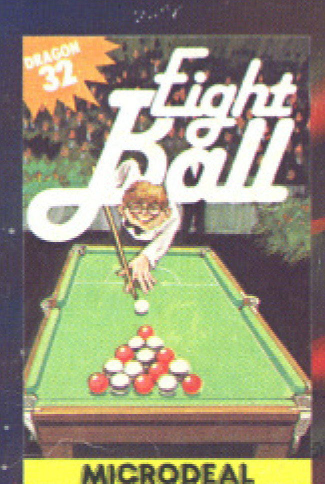
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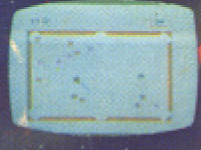
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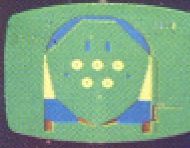




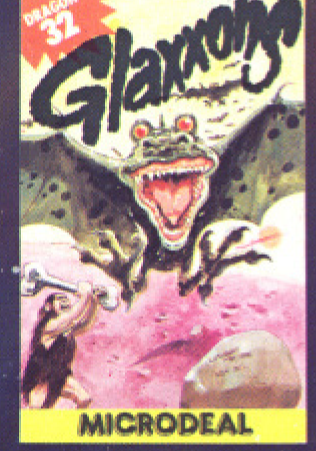


Pool on
the T.V.
1st for the Dragon

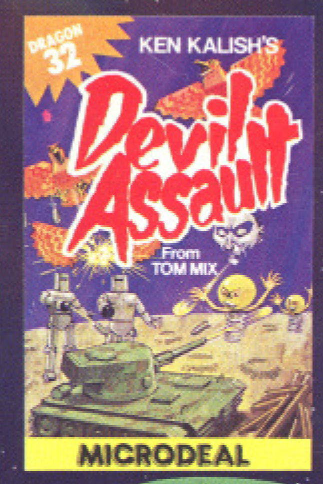
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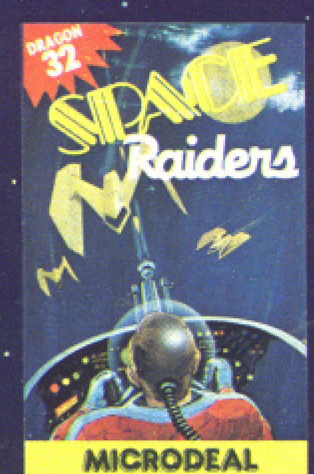


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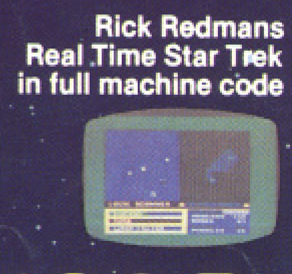
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many

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